Expanded Site Inspection
Final Report

MSD #4 Sludge and Barrel Dump
Chicago, Illinois
ILD 980 498 349

September 25, 1995

Prepared for:
U.S. Environmental Protection Agency
under Alternative Remedial Contracting Strategy (ARCS)
Contract 68-W8-0064, Work Assignment 33-5JZZ
ARCS Contractor Project 71280.108

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1.0 Introduction

On February 4, 1993, the Alternative Remedial Contracting Strategy (ARCS) contractor was authorized, by approval of the work plan amendment by the U.S. Environmental Protection Agency (USEPA) Region V, to conduct an expanded site inspection (ESI) of the MSD #4 Sludge and Barrel Dump (MSD #4) site in Chicago, Cook County, Illinois.

The site was initially placed on the Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS) on June 10, 1980, as a result of a discovery action initiated by the USEPA.

The facility received its initial Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation in the form of a preliminary assessment (PA) report completed by Mary Schroder, Illinois Environmental Protection Agency (IEPA), on January 1, 1984. The sampling portion of the ESI was conducted on July 13 through 15, 1993, when a field team collected 4 surface water samples, 8 sediment samples, and 2 soil samples.

The purposes of the ESI have been stated by USEPA in a directive outlining site inspection performed under CERCLA. The directive states:

> The objective of the expanded site inspection (SI) is to provide documentation for the Hazard Ranking System (HRS) package to support National Priority List (NPL) rulemaking. Remaining HRS information requirements are addressed and site hypotheses not completely supported during previous investigations are evaluated. Expanded SI sampling is designed to satisfy HRS data requirements by documenting observed releases, observed contamination, and levels of actual contamination at targets. In addition, investigators collect remaining non-sampling information. Sampling during the expanded SI includes background and quality assurance/quality control samples to fully document releases and attribute them to the site. Following the expanded SI, USEPA site assessment managers assign the site a priority for HRS package preparation and proposal to the NPL.

USEPA Region V requested ARCS to identify sites during the ESI that may require removal action to remediate an immediate human health or environmental threat.

2.0 Site Background

2.1 Introduction

This section includes information obtained during the ESI and from reports of previous site activities.

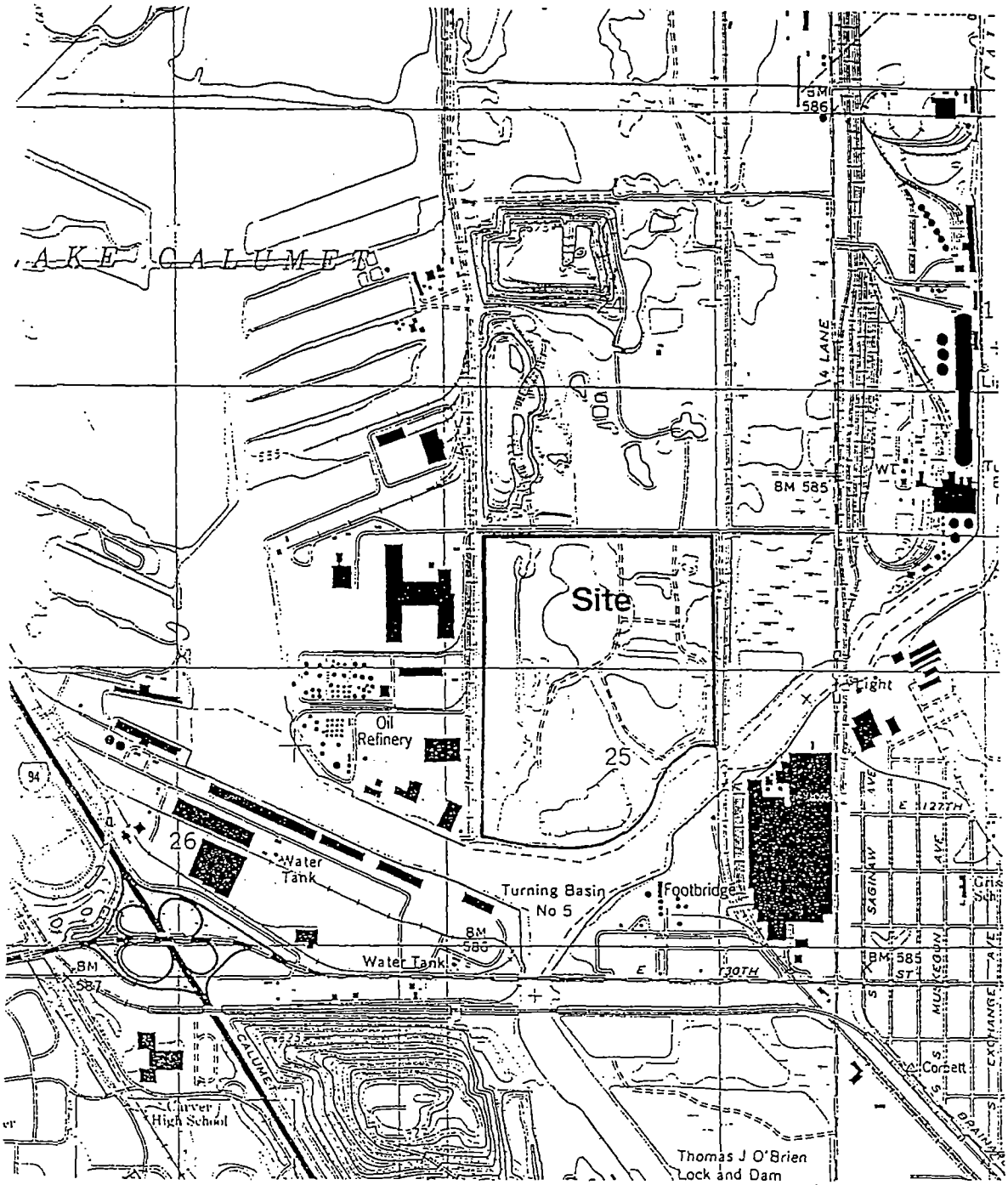
2.2 Site Description

The MSD #4 Sludge and Barrel Dump (MSD #4) site is located in southeastern Chicago, near Lake Calumet (Figure 2-1). The site is bounded on the north by 122nd Street, on the east by the Norfolk and Western Railroad, on the south by the Calumet River, and on the west by Stony Island Avenue (Figure 2-2). The site is located in the western half of the northeastern quarter of Section 25, Township 37 North, Range 14 East of the Third Principal Meridian, Cook County, Illinois.

The site is divided into two parcels (Figure 2-2). The northeastern parcel is operated as a gun club; the remainder of the area is owned by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), previously known as the Metropolitan Sanitary District (MSD), and is operated as the Stony Island Avenue Biosolids Processing (Stony) facility. The gun club covers approximately forty to sixty acres; the Stony facility covers approximately 195 acres.

The gun club property is held in trust by the Cosmopolitan Bank and Trust of Chicago, Illinois (Cosmopolitan 1993). Before 1871, the property was surveyed into lots for development as a residential area with assigned street names; however, the area was not developed. Only Crandon Avenue, 124th Street, and an unnamed road along the eastern boundary exist onsite today. These streets are unimproved dirt roads. Two or three ponds and several areas of wetland vegetation are on the property. The gun club building, an outhouse, a small dock, a row of bee hives, and two skeet launching sheds are at the northern end of the pond on the eastern boundary. The gun club is reputed to be active, especially during duck hunting season.

The Stony facility is active, operating under a permit issued by IEPA and National Pollutant Discharge Elimination System (NPDES) Permit No. 00280253. The facility receives municipal sludge generated at the MWRDGC Lawndale Avenue Solids Management Area, dries the sludge, and transports it to CID Landfill, in



Sources:
USGS Lake Calumet Quadrangle, 1991

Not to Scale

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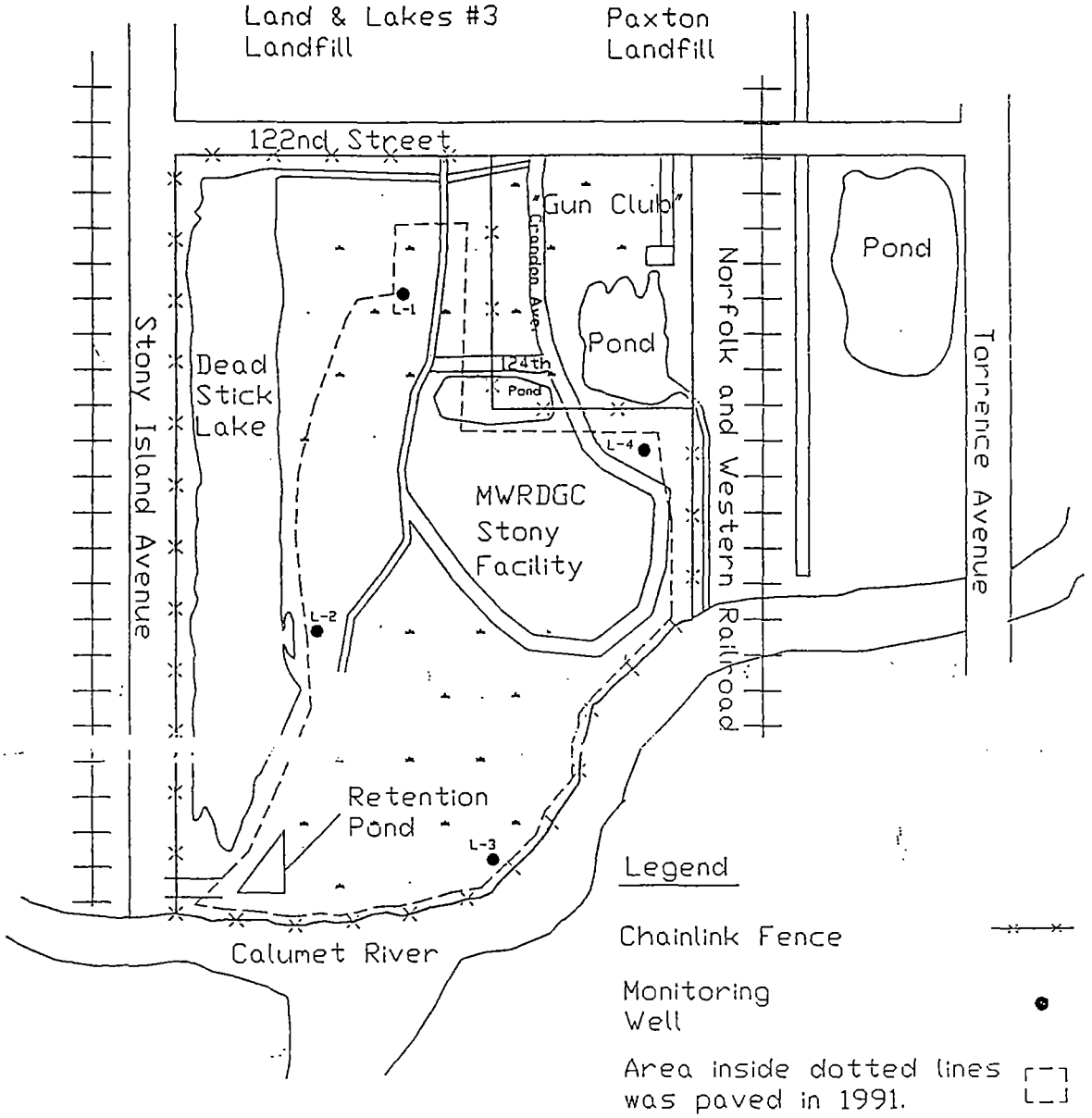
Figure 2-1
Site Location Map

MSD #4 Sludge and Banel Dump
Chicago, Illinois

Name FRE00024
Date: 03/28/94



Sources:
USGS Lake Calumet Quadrangle, 1977, 1991
MWRDGC Aerial Photograph, 1992

Not to Scale

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Figure 2-2
Site Sketch

MSD #4 Sludge and Barrel Dump
Chicago, Illinois

Name FRE00023
Date: 03/28/94

Chicago, Illinois, for daily cover. Approximately 250 cubic yards of sludge per day, five days per week, are hauled from the Stony facility to the landfill.

The Stony property is fenced with six-foot chain link fencing. The office, parking lots, and weighing station are located in the northern third of the L-shaped property. Asphalt-paved sludge drying beds cover most of the property. Asphalt berms around the drying beds direct runoff to a large retention pond in the southwestern corner of the property. Solids in the runoff are allowed to settle, and supernatant fluid is released to the sanitary sewer that goes to the Calumet Wastewater Treatment Plant.

A narrow, marshy pond called Dead Stick Lake is along the western border inside the fence. This pond is fed by runoff from the gun club property and other undetermined areas to the north of 122nd Street; the pond does not receive runoff from the Stony facility.

The vicinity around the MSD #4 site is industrial; much of the area is occupied by landfills. Within a mile radius of the site are Land and Lakes No. 3 Landfill, Paxton I and II Landfills, U.S. Drum II site, and Alburn Incinerator site to the north; the Norfolk and Western Railroad, ponds that include a rookery of the federally-designated endangered black-crowned night heron, Torrence Avenue, and the industry along Torrence to the east; the confluence of Lake Calumet, the Calumet River and the Little Calumet River, CID Landfill, and industry to the south; and Stony Island Avenue, a railroad spur, industry, an oil refinery, Lake Calumet and boat docks to the west. Land use further from the site is industrial interspersed with wetlands and residential communities. Although the residential area within a four-mile radius is mostly within Chicago city limits, it also includes portions of Calumet City, Dolton, and South Holland, Illinois, and Hammond, Indiana. Appendix A presents maps showing the topographic features within a four-mile radius of the site and along the 15-mile downstream distance.

2.3 Site History

2.3.1 Operational History

Before 1980, the Stony facility area was used for the disposal of dredged material from the Calumet River (USGS 1977).

In 1980, USEPA representatives identified the MSD #4 site. According to a 1980 USEPA memorandum, a considerable amount of sludge and about thirty drums were identified at the site (USEPA 1980a). During the initial discovery, the sludge

and drums were considered to be one problem. The USEPA contacted the IEPA and MSD about the sludge and drums. MSD stated the property and sludge were theirs (USEPA 1980b). It was discovered that the site consisted of two pieces of property, the MSD #4 sludge drying area and the gun club property where the drums were. MSD and government regulatory agencies addressed the sludge as a separate issue from the drum problem.

When USEPA first identified the sludge drying operation in June 1980, it was reported that the sludge could reach the Calumet River about 200 feet to the south. Before paving the beds in 1991, the sludge was dried directly on the soil and constituents of concern may have been released to facility soils. Runoff may have escaped the facility before control was improved.

In 1980, Crandon Avenue, which runs through gun club property, was used as the access road for the Stony facility. At the request of the gun club, MSD stopped using Crandon Avenue as its access road. The entrance was moved to Stony Island Avenue and 126th Street, in the southwestern corner of the site. In 1991, the entrance was moved to Paxton Avenue, off of 122nd Street, on the northern side of the site.

In 1980, MSD personnel were notified that drums had been discovered along the Crandon Avenue access road. MSD tracked down a third party: Troch Disposal of North Long Avenue, Chicago, which was responsible for the drums (USEPA 1980b). Troch Disposal stated the drums had been in a dumpster that was stolen from Troch. Additional drums were discovered onsite (USEPA 1980c). Troch Disposal agreed to remove the drums.

In July 1980, 202 drums were removed. In the process, however, Troch Disposal employees released the contents of some or all of the drums to wetlands on both sides of Crandon Avenue. An IEPA representative observed the last 25 drums loaded on a truck. The drums had holes in them, and a pick stained with blue-black material was observed leaning against the truck. When asked if he had punctured the drums, the Troch Disposal employee replied that he had to so that he could get the drums out of the swamp. The Troch Disposal employee said 82 drums were taken from the eastern side of Crandon Avenue; 120 drums were taken from the western side of the road (IEPA 1980).

An IEPA representative told Troch Disposal personnel and management that the dumping was illegal, contaminated soil would have to be removed, and confirmatory sampling would need to be conducted. Subsequent inspections revealed

a thin layer of soil was applied to areas saturated with waste materials. No cleanup efforts were detected, and no sampling was conducted (IEPA 1980).

2.3.2 Summary of Onsite Environmental Work

Before the expanded site inspection, no sampling has been done in association with the 1980 drum release along the Crandon Avenue access road. No cleanup activities at the drum release location are known to have occurred. In July 1980, it was noted that a thin layer of soil was applied to the areas saturated with waste materials.

In 1983, USEPA collected and analyzed 16 sediment samples from the eastern Lake Calumet area. One sample was from the ditch along 122nd Street, near to and downgradient of the drum release. Elevated concentrations of organic compounds and inorganic substances were identified in the sample. Elevated concentrations of inorganic substances were identified in other sediment samples collected from the ponds and ditches around the Stony facility (USEPA 1983).

On September 19, 1984, a USEPA field investigation team conducted a site inspection. The drum release location could not be identified (USEPA 1984).

A USEPA PA Reassessment was conducted in October 1991, as part of a review of sites in south eastern Chicago. The PA consisted of a file review and site visit. The drum release location could not be identified, but the site was assigned a medium priority. It was recommended that sampling be conducted to determine whether targets have been affected by the releases or by the possible lead contamination of sediments from hunting shot (USEPA 1991).

The Stony facility has an operating permit issued by the IEPA and is included (though not specified) on the Lawndale Avenue Solids Management Area (LASMA) NPDES permit no. 00280253 as an approved sludge management scheme (IEPA 1993). The Stony facility has been improved numerous times since operations began in approximately 1980. Improvements include asphalt-paved sludge drying areas, berms, runoff control, a runoff retention pond, and improved security. Runoff is held in the southwestern retention pond and allowed to settle; clear water is released to the city storm sewer that goes to the Calumet Wastewater Treatment Plant. Four glacial drift monitoring wells, located around the perimeter, are sampled twice a month by the MWRDGC research and development division; the analytical results are submitted to the IEPA, along with analyses of digested sludge placed in the site

and processed sludge removed from the site. Typical composition of the processed sludge is:

Total Solids	83.9	%
Total Volatile Solids	34.5	%
Total Kjeldahl Nitrogen (TKN)	11,920	mg/wet kg
Ammonia Nitrogen (NH3-N)	873	mg/wet kg
Total Phosphorus	12,772	mg/wet kg
Aluminum	11,125	mg/wet kg
Arsenic	<0.1	mg/wet kg
Boron	69.5	mg/wet kg
Calcium	38,625	mg/wet kg
Cadmium	46.3	mg/wet kg
Chromium	980	mg/wet kg
Copper	788	mg/wet kg
Iron	12,025	mg/wet kg
Mercury	3.55	mg/wet kg
Potassium	1,878	mg/wet kg
Magnesium	18,650	mg/wet kg
Manganese	927	mg/wet kg
Sodium	875	mg/wet kg
Nickel	110.0	mg/wet kg
Lead	329	mg/wet kg
Selenium	<0.2	mg/wet kg
Zinc	1,575	mg/wet kg

Current environmental activity at the MSD #4 site is limited to this ESI, which concentrates on the drum release, the possible release of sludge components before the regulation of the sludge drying facility, and the possible lead contamination of sediments from hunting shot.

2.4 Applicability of Other Statutes

The Stony facility is active, operating under IEPA permit 1990-AO-1993, issued to the Stickney Wastewater Reclamation Plant, and NPDES permit no. 00280253 issued to the Lawndale Avenue Solids Management Area. MWRDGC representatives have stated the Stony facility is in compliance with 40 CFR Part 503, EPA Standards for the Use or Disposal of Sewage Sludge.

The gun club property is not regulated by a government environmental entity. The IEPA maintains a file concerning the drum release.

The site entities, the Stony facility, and the gun club, are not regulated under the Resource Conservation and Recovery Act.

3.0 Site Inspection Activities and Analytical Results

3.1 Introduction

This section outlines the procedures used and observations made during the ESI conducted at the MSD #4 site. Sampling activities were conducted in accordance with the 1991 quality assurance project plan (QAPjP). Figures 3-1 and 3-2 show sample locations. Table 3-1 summarizes sample descriptions and locations.

ESI samples were analyzed for organic and inorganic substances contained on the USEPA target compound list (TCL) and target analyte list (TAL) by USEPA Contract Laboratory Program (CLP) participant laboratories. Appendix B presents the TCL and TAL. Appendix C presents a summary of analytical data generated by ESI sampling. Appendix D contains photographs of the site and sample locations.

3.2 Site Reconnaissance

On April 13, 1994, a reconnaissance of MSD #4 was conducted. This visit included a visual site inspection to determine site status, facility activities, health or safety hazards, and potential sampling locations.

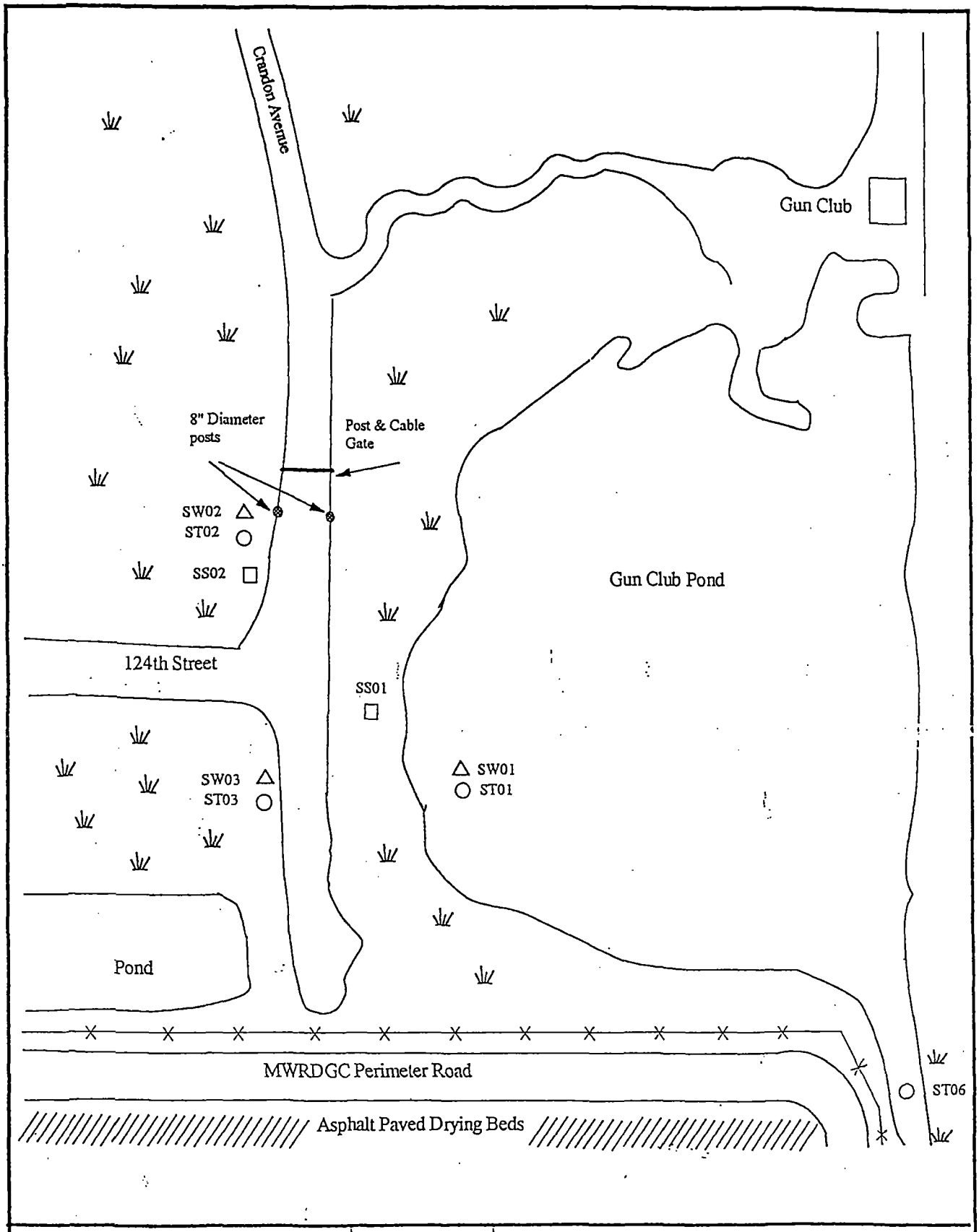
A site representative of the MWRDGC was interviewed during the reconnaissance; no representative of the gun club property was present. A site drive-through inspection was conducted. The drive-through tour included the periphery of the gun club property, but it did not include the actual club property. Potential sampling locations were identified.

3.3 Site Representative Interview

Mr. George W. Hall, MWRDGC land reclamation engineer, was interviewed by the reconnaissance team on April 13, 1994, at the Stony facility office. The reconnaissance team explained the purpose of the ESI to him and gathered site-specific information. At this time, Mr. Hall said he thought the drum release had occurred on gun club property, which was separate from MWRDGC property.

3.4 Preliminary Screening Using Head Space Analysis

On July 13, 1993, a field team collected 1 surface soil and 16 sediment samples for qualitative field analysis using an organic vapor analyzer (OVA). The samples were intended to identify the probable location of the 1980 drum release, which had



Legend:
- Sediment Sample
- Surface Water Sample
- Surface Soil Sample
- Phragmites & Other Wetland Vegetation
- Fence

Not to Scale

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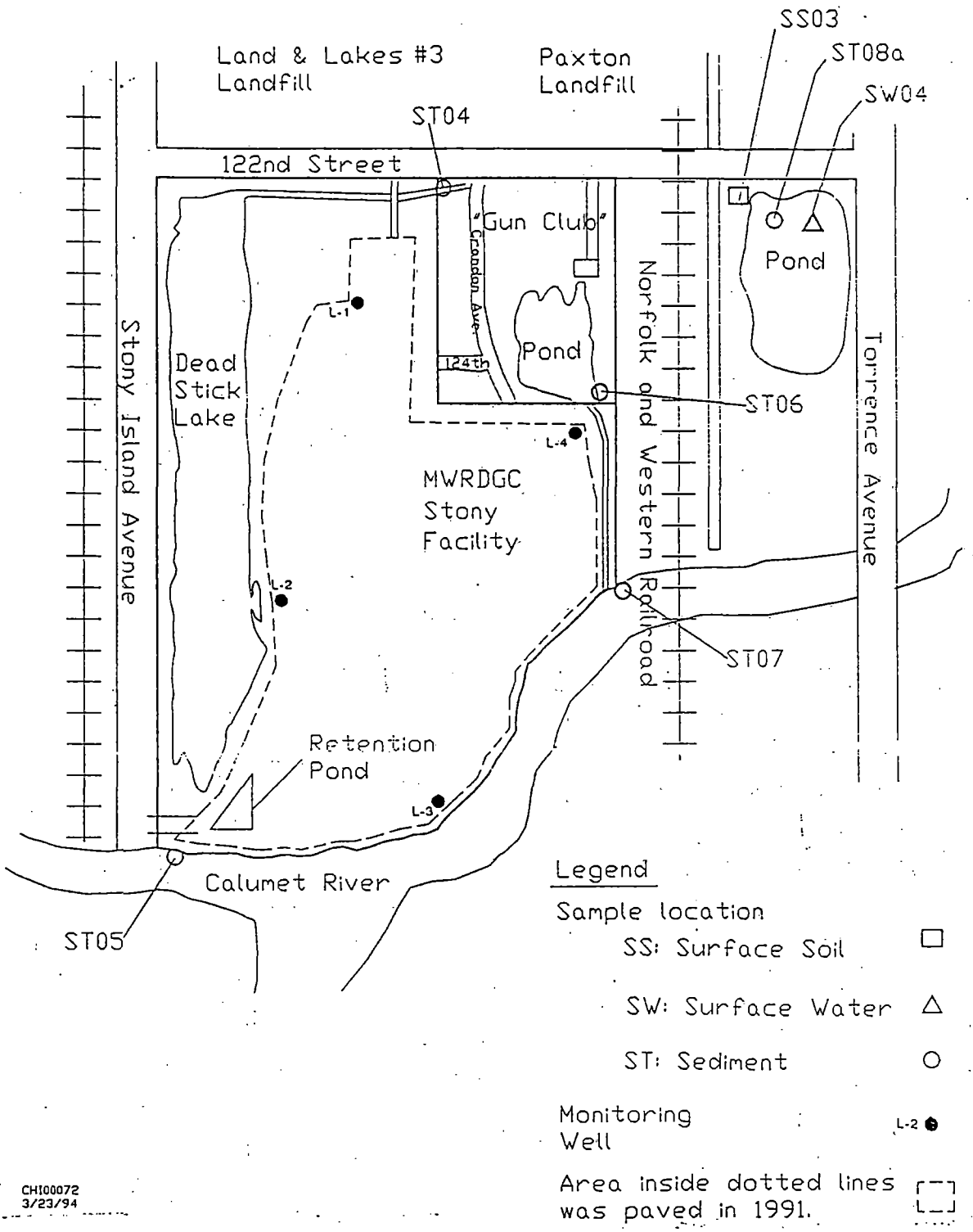
Figure 3-1
Sample Location Map, Drum Release Area

MSD #4 Sludge and Barrel Dump
Chicago, Illinois

Name: FRE 00020

Date: 03/23/94



Source:
USGS Lake Calumet Quadrangle 1977, 1991; MWRDGC Aerial Photograph, 1992

Not to Scale

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Figure 3-2
Sample Location Map, Perimeter Samples

MSD #4 Sludge and Barrel Dump
Chicago, Illinois

Name FRE00022
Date: 03/23/94

Table 3-1
Sample Summary

Sample	Location	Description
SW01	East of Crandon Avenue, near 124th Street.	Surface water sample, slightly cloudy, some plant material
SW02	West of Crandon Avenue, north of 124th Street.	Surface water sample, slightly cloudy, light brown, some plant material
SW03	West of Crandon Avenue, south of 124th Street.	Surface water sample, cloudy, brown, some plant material
SW04	South of 122nd Street, east of Norfolk and Western Railroad, background.	Surface water sample, slightly cloudy, some plant material
ST01	East of Crandon Avenue, near 124th Street, background	Sediment sample, dark brown, silty, organic material
ST02	West of Crandon Avenue, north of 124th Street, background.	Sediment sample, dark brown, silty, organic material
ST03	West of Crandon Avenue, south of 124th Street.	Sediment sample, dark brown, silty, organic material
ST04	In ditch on the south side of 122nd Street, west of the gun club property.	Sediment sample, black silty sediment with organic odor
ST05	Outlet of Dead Stick Lake to Calumet River.	Sediment sample, clayey gravel
ST06	Head of the ditch draining the pond by gun club building.	Sediment sample, black muck, no odor
ST07	Outlet of the ditch draining the pond by gun club building.	Sediment sample, gravelly sand, few organics
ST08	South of 122nd Street, east of Norfolk and West Railroad, original background (rejected).	Sediment sample, grey clayey sediment

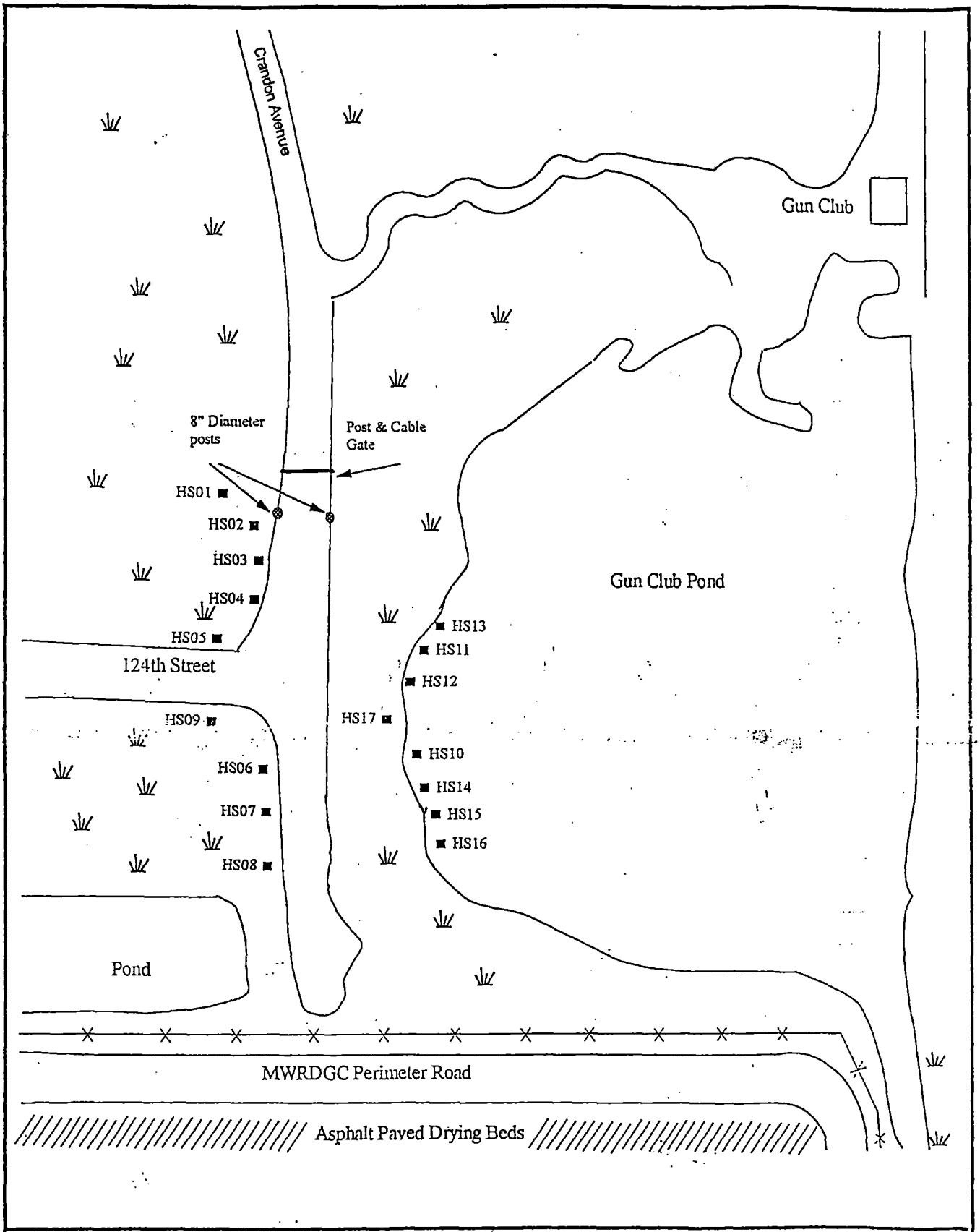
Table 3-1 (Continued) Sample Summary		
Sample	Location	Description
SS01	East of Crandon Avenue, near 124th Street.	Soil sample, brown, hard clayey material
SS02	West of Crandon Avenue, north of 124th Street, substitute background.	Soil sample, brown clayey material
SS03	South of 122nd Street, east of Norfolk and Western Railroad, original background (rejected).	Soil sample, brown, some organic material

not been ascertained during a 1984 site inspection or during the 1991 preliminary assessment.

Qualitative sediment samples were collected by digging a shovelful of material from a location assumed to be near the release and filling an 8-ounce wide mouth jar half-full with the material. The jar opening immediately was covered with two layers of aluminum foil and tightly capped. The jar was shaken, and the sample was kept out of the sun for at least ten minutes, to allow vapors to be released from the material. The lid was removed, the OVA probe was pushed through the aluminum foil, and a reading was noted. This process was repeated at 16 locations (HS01 through HS16). HS17 was collected from non-saturated surface soil using a similar method. Figure 3-3 shows head space sample locations. The OVA readings identified spots where organic vapors were relatively high. These spots were chosen for quantitative sample collection the next day. Table 3-2 presents head space values.

3.5 Surface Water/Sediment Samples

On July 14 and 15, 1993, the field team collected four surface water (SW01 through SW04) and eight sediment (ST01 through ST08) samples. Surface water samples were collected by dipping the sample bottles into the water body before the sediments had been disturbed. The sediment samples were collected by digging a shovelful of material from the chosen location, taking a portion from the shovel with a clean stainless steel spoon, and filling the clean sample jars. Two sediment samples, ST04 and ST05, were split with MWRDGC. Figures 3-1 and 3-2 show sample locations; Table 3-1 summarizes sample locations and descriptions.



Legend:

HS# ■ Head Space Sample Location

Phragmites & Other Wetland Vegetation

Fence

Not to Scale

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Figure 3-3
Head Space Sample Locations

MSD #4 Sludge and Barrel Dump
Chicago, Illinois

Name: FRE 00019

Date: 08/08/94

Table 3-2 Head Space Analysis Results	
Station	OVA Reading
HS01	> 1,000 ppb
HS02	> 1,000 ppb
HS03	200 ppb
HS04	850 ppb
HS05	> 1,000 ppb
HS06	100 ppb
HS07	250 ppb
HS08	> 1,000 ppb
HS09	290 ppb
HS10	> 1,000 ppb
HS11	250 ppb
HS12	> 1,000 ppb
HS13	600 ppb
HS14	> 100 ppb
HS15	64 ppb
HS16	500 ppb
HS17	0 ppb

Sample jars were sealed, labeled, packaged, and transported to USEPA CLP participant laboratories in accordance with procedures set forth in the QAPjP.

Surface water and sediment samples scheduled for organic analysis were shipped to Pace Laboratories in Lenexa, Kansas, on July 15, 1993. Surface water and sediment samples scheduled for inorganic analysis were shipped to TMA/Skinner & Sherman Labs, Inc., in Waltham, Massachusetts, on July 15, 1993. Samples were analyzed for TCL and TAL substances under a routine analytical services request.

A background surface water sample (SW04) and a background sediment sample (ST08) were collected northeast of the site, near the southeastern corner of the intersection of 122nd Street and the Norfolk and Western Railroad. This location was chosen to represent natural surface water and sediment conditions because the drainage pathway is not connected to the gun club property or the Stony facility drainage. However, the sediment sample contained high concentrations of TCL and

TAL substances. Consequently, analytical results for this sample were considered not to represent area natural sediment conditions and were rejected. Analytical results for sediment sample ST01 collected east of Crandon Avenue near the intersection of 124th Street were substituted.

Three sets of surface water and sediment samples (SW01, ST01, SW02, ST02, SW03, and ST03) were collected near the intersection of 124th Street and Crandon Avenue. These sample locations were in the immediate vicinity of preliminary head space samples with OVA readings exceeding 1,000 ppb. (Sediment sample ST01 was later substituted as the background sediment sample). One sediment sample was collected at the head (ST06) and one at the mouth (ST07) of the ditch that drains the gun club pond. These samples were taken to determine whether this drainage system was affected by possible site releases. One sediment sample was collected south of 122nd Street and west of the gun club property (ST04), in the ditch draining the western portion of the gun club property into Dead Stick Lake. Another sample (ST05) was collected at the outfall of Dead Stick Lake to the Calumet River. These samples were collected to determine whether the Dead Stick Lake drainage system was affected by possible site releases.

Reusable sampling and personal protective equipment (PPE) were decontaminated before transport offsite. Disposable sampling and PPE items were discarded in accordance with procedures outlined in the ESI project work plan and the QAPjP.

3.6 Soil Samples

On July 14 and 15, 1993, a field team collected three surface soil samples (SS01, SS02, and SS03). Each sample was collected from a depth of 0 to 6 inches with a clean, stainless steel spoon and placed in a clean sample jar. None of the samples were split with potentially responsible parties. Figures 3-1 and 3-2 show sample locations; Table 3-1 summarizes sample locations and descriptions.

Sample jars were sealed, labeled, packaged, and transported to USEPA CLP participant laboratories in accordance with procedures set forth in the QAPjP.

Soil samples scheduled for organic analysis were shipped to Clayton Environmental Consultants, in Novi, Michigan, on July 15, 1993. Soil samples scheduled for inorganic analysis were shipped to Chemtech Consulting Group in Engelwood, New Jersey, on July 15, 1993. Samples were analyzed for TCL and TAL substances under a routine analytical services request.

A background soil sample (SS03) was collected northeast of the site at the southeastern corner of the intersection of 122nd Street and the Norfolk and Western Railroad. This location was selected as representative of natural soil conditions in the area; however, the background soil sample contained high concentrations of TCL and TAL substances. Analytical results for this sample were considered not to be representative of natural soil conditions in the area and were rejected. Analytical results for soil sample SS02 collected west of Crandon Avenue, north of 124th Street were substituted.

Two soil samples were collected near the intersection of 124th Street and Crandon Avenue: one on the east side (SS01) and one on the west side of Crandon (SS02), in the area where drums are thought to have been released.

Reusable sampling equipment and PPE were decontaminated before transport offsite. Disposable sampling and PPE items were discarded in accordance with procedures outlined in the ESI project work plan and the QAPjP.

3.7 Analytical Results

This section summarizes analytical results from ESI samples. Appendix C presents the ESI analytical data.

3.7.1 Surface Water/Sediment

Surface water sample SW01 was collected east of the 124th Street and Crandon Avenue intersection. No volatile or semivolatile organic compounds were detected in SW01. The inorganic analysis indicated the presence of cobalt (3.2 μg/L B), mercury (0.10 μg/L B), nickel (10.9 μg/L B), potassium (55,600 μg/L), and cyanide (50.3 μg/L).

Samples ST02 and SW02 were collected northwest of the 124th Street and Crandon Avenue intersection. No volatile organic compounds were detected in either sample. The semivolatile compounds, diethylphthalate (1,300 μg/kg), and di-n-butylphthalate (2,200 μg/kg) were detected in sediment sample ST02. No semivolatile organic compounds were detected in SW02. The inorganic analysis revealed and lead (44.4 mg/kg) and mercury (0.09 mg.kg) in ST02, and mercury (0.25 μg/L) and nickel (4.1 μg/L B) in SW02.

Samples SW03 and ST03 were collected southwest of the 124th Street and Crandon Avenue intersection. The volatile organic compound, toluene, was found in ST03 (63 μg/kg J) and SW03 (14 μg/L). No semivolatile compounds were

identified in these samples. The pesticides, 4,4'-DDE (54 μg/kg J) and 4,4'-DDD (47 μg/kg J) were found in ST03. The elements, beryllium (0.73 μg/L B), cobalt (9.5 μg/L B), lead (49.0 μg/L S), nickel (21.7 μg/L B), potassium (18,800 μg/L), and vanadium (21.4 μg/L B) were found in SW03. No elevated concentrations of inorganic substances were found in sediment sample ST03.

Sediment sample ST04 was collected at the northwestern gun club boundary. The laboratory analysis of ST04 revealed 8 semivolatile organic compounds, including fluorene (1,300 μg/kg), phenanthrene (26,000 μg/kg D), anthracene (1,800 μg/kg), fluoranthene (38,000 μg/kg D), pyrene (34,000 μg/kg D), benzo(a)anthracene (16,000 μg/kg D), chrysene (14,000 μg/kg D), benzo(b)fluoranthene (1,600 μg/kg J), and benzo(k)fluoranthene (1,100 μg/kg J); one pesticide, 4,4'-DDD (67 μg/kg JD); and two polychlorinated biphenyls (PCBs), Aroclor-1248 (10,000 μg/kg) and Aroclor-1260 (6,100 μg/kg JP). Fourteen inorganic analytes, including aluminum (12,300 μg/kg) barium (518 mg/kg), cadmium (6.9 mg/kg), chromium (193 mg/kg), copper (206.0 μg/kg), iron (40,200 μg/kg), lead (251 mg/kg), mercury (0.77 mg/kg), nickel (45.1 mg/kg) selenium (2.4 mg/kg), silver (5.6 mg/kg), sodium (1,380 mg/kg B), vanadium (50.7 mg/kg), zinc (687 mg/kg), and cyanide (1.8 mg/kg), were identified in ST04.

Sediment sample ST05 was collected downgradient of ST04, at the outfall of Dead Stick Lake to the Calumet River. No volatile or semivolatile organic compounds, or pesticides were detected in the sample. The inorganic substances lead (73.0 mg/kg), mercury (0.13 mg/kg), and zinc (494 mg/kg) were detected.

Sediment sample ST06 was collected on the eastern side of the gun club pond, near an outlet to a ditch. No volatile, pesticide/PCB, or inorganic substances were identified, but 4 semivolatile compounds, including phenanthrene (1,800 μg/kg), fluoranthene (2,300 μg/kg), pyrene (2,000 μg/kg), and benzo(k)fluoranthene (1,400 μg/kg) were found.

Sediment sample ST07 was collected a few hundred feet downgradient of ST06 at the ditch outlet to the Calumet River. No volatile or semivolatile compounds or pesticides were identified. The inorganic substance arsenic was found at 17.6 mg/kg.

3.7.2 Surface Soil

The laboratory organic analysis of surface soil sample SS01 did not identify volatile or semivolatile compounds or pesticides. The inorganic analyte silver was identified at 3.1 mg/kg JN.

3.8 Key Samples

"Key samples" are those samples that contain substances in sufficient concentrations to document an observed release. Table 3-3 identifies ESI key samples.

Table 3-3
Key Sample Summary

Substance	Sediments (ug/kg)							Surface Water (ug/L)				Surface Soil (ug/kg)	
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	SW01	SW02	SW03	SW04 Background	SS01	SS02 Background
Toluene	15 J		63 J							14	10 U		
Diethylphthalate	510 UJ	1300											
Fluorene	510 UJ			1300									
Phenanthrene	510 UJ			26000 D		1800							
Anthracene	510 UJ			1800									
di-n-Butylphthalate	510 UJ	2200											
Fluoranthene	510 UJ			38000 D		2300							
Pyrene	510 UJ			34000 D		2000							
Benzo(a)Anthracene	510 UJ			16000 D									
Chrysene	510 UJ			14000 D									
Benzo(b)Fluoranthene	510 UJ			1600 J									
Benzo(k)Fluoranthene	510 UJ			1100 J		1400							
4,4'-DDE	25 J		54 J										
4,4'-DDD	3.8 J		47 J	67 JD									
Aroclor-1248	61 JP			10000									
Aroclor-1260	50 UJ			6100 JP									

Table 3-3 (Continued)
Key Sample Summary

Substance	Sediments (mg/kg)							Surface Water (ug/L)				Surface Soil (mg/kg)	
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	SW01	SW02	SW03	SW04 Background	SS01	SS02 Background
Aluminum	34.30			12300									
Arsenic	3.6						17.6						
Barium	38.4 B			518									
Beryllium										0.73 B	0.4 U		
Cadmium	1.1 B			6.9									
Chromium	36.9			193									
Cobalt	4.1 B							3.2 B		9.5 B	1.5 U		
Copper	23.8			206.0									
Iron	9990			40200									
Lead	23.2	44.4		251	73.0					49.0 S	15.3 S		
Mercury	0.07 U	0.09		0.77	0.13			0.10 B	0.25		0.10 U		
Nickel	13.1			45.1				10.9 B	4.1 B	21.7 B	3.7 U		
Potassium								55600		18800	4280 B		
Selenium	0.68 U			2.4									
Silver	1.5 U			5.6								3.1 JN	1.4 UJN
Sodium	390 B			1380 B									
Vanadium	15.8			50.7						21.4 B	2.6 B		
Zinc	87.2			687	494								
Cyanide	0.70 U			1.8				50.3			10.0 U		

Notes:

SW Surface water sample
ST Sediment sample
SS Surface soil sample

GENERAL QUALIFIERS

D Compound identified at secondary dilution factor.
J Reported value estimated.
R Data unusable.
U Substance undetected. The reported value is the contract required quantitation limit (CRQL).

PESTICIDE/AROCLOR QUALIFIERS

P Greater than 25% difference between two GC columns. The lower value is reported.

ORGANIC ANALYSIS QUALIFIERS

B Analyte found in the associated blank.

INORGANIC ANALYSIS QUALIFIERS

B Reported value less than CRDL, but greater than instrument detection limit.
S Value determined by method of standard additions.
W Spike for AA analysis is out of control limits.
* Dupilcate analysis was not within control limits.

4.0 Characterization of Sources

4.1 Introduction

Analysis of ESI samples led to the identification of two sources at the MSD #4 site: the drum release location on the gun club property and the northwestern portion of the gun club property. Sample analysis results did not conclusively attribute substances to the release of sludge components before the regulation of the sludge drying facility nor to lead from hunting shot.

4.2 Waste Source: Drum Release Area

4.2.1 Description

In 1980, 202 drums were left in the swamp on either side of Crandon Avenue, which was then the entrance road to the MSD #4 site. Subsequently, the drums were subsequently punctured and emptied into the wetland. According to a Troch Disposal employee, 82 drums were taken from the eastern side of the road and 120 drums were taken from the western side of the road. IEPA employees estimated the release covered approximately two acres; however, descriptions and a release location sketch do not identify the affected area adequately. Materials released from the drums were identified visually as printing wastes. Chemical testing of the material was not conducted.

4.2.2 Waste Characteristics

Two soil samples, SS01 and SS02, were collected in the drum release area. Sample SS01 was collected east of the intersection of 124th Street and Crandon Avenue. Sample SS02 was used to establish background concentrations. No volatile or semivolatile compounds were detected in SS01. Inorganic analysis revealed silver at 3.1 mg/kg JN.

4.3 Waste Source: Northwestern Portion of the Gun Club

4.3.1 Description

No source or soil samples to attribute substances to the source were collected from the northwestern portion of the gun club property. Elevated concentrations of substances contained in an ESI sediment sample were used, however, to attribute substances to the source area.

Sediment sample ST04 was collected from a ditch that receives water from the western half of the gun club property. This location is upgradient of a sediment sample collected in 1983 that showed organic and inorganic substances in the ditch draining to the west (USEPA 1983). The 1983 sample and the 1993 ESI sample, collected upgradient (east) of the 1983 sample, contain similar substances and concentrations, which are different from those found in the drum release area.

4.3.2 Waste Characteristics

Analysis of ST04 revealed the largest number of TCL and TAL substances with the highest concentrations of all ESI samples. The following volatile, semivolatile, pesticides, PCB, and inorganic substances were found at this location:

Fluorene	1,300 µg/kg	Cadmium	6.9 mg/kg
Phenanthrene	26,000 µg/kg D	Chromium	193 mg/kg
Anthracene	1,800 µg/kg	Copper	206.0 mg/kg
Fluoranthene	38,000 D µg/kg	Cyanide	1.8 mg/kg
Pyrene	34,000 µg/kg D	Iron	40,200 mg/kg
Benzo(a)Anthracene	16,000 µg/kg D	Lead	251 mg/kg
Chrysene	14,000 µg/kg D	Mercury	0.77 mg/kg
Benzo(b)Fluoranthene	1,600 µg/kg J	Nickel	45.1 mg/kg
Benzo(k)Fluoranthene	1,100 µg/kg J	Selenium	2.4 mg/kg
4,4'-,DDD	67 µg/kg JD	Silver	5.6 mg/kg
Aroclor-1248	10,000 µg/kg	Sodium	1380 mg/kg B
Aroclor-1260	6,100 µg/kg JP	Vanadium	50.7 mg/kg
Aluminum	12,300 mg/kg	Zinc	687 mg/kg
Barium	518 mg/kg		

5.0 Discussion of Migration Pathways

5.1 Introduction

This section discusses the potential impact of contaminants found at the MSD #4 site on the four migration pathways: groundwater, surface water, air, and soil.

5.2 Groundwater

Area aquifers include the surficial glacial drift aquifer and the Silurian dolomite aquifer. Although substances originating from the site may have affected the shallow glacial drift aquifer, the site's HRS groundwater pathway score is low because few targets near the site use groundwater for their drinking water. Drinking water is supplied to city residents from surface water intakes located in Lake Michigan.

An evaluation of glacial drift aquifer groundwater samples collected by MWRDGC from the monitoring wells around the Stony Facility (MWRDGC 1994) revealed that no federal Maximum Contaminant Level was exceeded. The federal Secondary Maximum Contaminant Levels for total dissolved solids, chloride, sulfate, aluminum, iron, and manganese were exceeded slightly, yet regularly. No compounds on the TCL were analyzed for.

5.3 Surface Water

The overland flow from the Stony facility is not considered to be threatened because the facility runoff is collected, solids are settled, and supernatant fluid is released to the City of Chicago storm sewer system. Before MWRDGC completed the runoff control system in 1991, the probable point of entry to the overland flow route would have been along the eastern bank of Dead Stick Lake and along the northern bank of the Calumet River. During the time releases may have occurred (roughly 1980 to 1991), sludge probably included heavy metals from industrial sources. Heavy metals, however, usually are bound tightly to sludge particles; therefore, they would be unlikely to affect the water.

The overland flow from the gun club property appears to follow two paths. Water on the western side of Crandon Avenue follows the first path: north to 122nd Street, then west in the ditch along the southern side of 122nd Street to Dead Stick Lake, and south through the lake to the Calumet River. The first overland flow path on the western side of Crandon Avenue was sampled at four locations: two onsite,

one at the northwestern gun club boundary, and one at the outlet of Dead Stick Lake.

Samples ST02 and SW02, were collected northwest of the intersection of 124th Street and Crandon Avenue. The semivolatile compounds, diethylphthalate, di-n-butylphthalate, were found in the sediment sample. Inorganic analysis revealed lead and mercury in the sediment; mercury and nickel in the surface water.

Samples SW03 and ST03 were collected southwest of the intersection of 124th Street and Crandon Avenue. The volatile compound, toluene, was found in the sediment and the surface water. The pesticides 4,4'-DDE, 4,4'-DDD, and were found in the sediment sample. The elements beryllium, cobalt, lead, nickel, potassium, and vanadium were found in the surface water sample.

Sediment sample ST04 was collected at the northwestern gun club boundary. This location is in the path of surface water originating on the western side of the gun club property, but the substances found were at concentrations greater than those found at the drum release area. Substances found in ST04, except for toluene, 4,4'-DDD, and lead, were different from those found at the assumed drum release location. Section 4.3.2 describes substances found in sediment sample ST04.

Sediment sample ST05 was collected downgradient of ST04, at the outfall of Dead Stick Lake to the Calumet River. Sample analysis revealed three inorganic substances, lead, mercury, and zinc. These substances were found at higher concentrations at ST04. With the exception of lead, these substances were not found at the assumed drum release area.

The second overland flow surface water pathway includes water that reaches the gun club pond and flows south in the ditch on the eastern site boundary to the Calumet River. Surface water on the eastern side of Crandon Avenue follows the second overland flow path from the gun club property.

The pathway on the eastern side of Crandon Avenue was sampled at three locations: one onsite, one at the outlet of the gun club pond in the southeastern corner of the site, and one at the outlet of the ditch draining the gun club pond.

Surface water samples SW01 and surface soil sample SS01 were collected east of the intersection of 124th Street and Crandon Avenue. Inorganic analysis revealed silver in the surface soil; cobalt, mercury, nickel, potassium, and cyanide in the surface water.

Sediment samples ST06 and ST07 were collected on the same surface water drainage path as the surface water sample SW01 and sediment sample ST01.

Sediment sample ST06 was collected on the southeastern side of the pond, near the pond's outlet to a ditch. This location is downgradient of SW01 and ST01, close to the Norfolk and Western Railway. No volatile, pesticide, PCB, or inorganic substance were identified, but 4 semivolatile compounds were found: phenanthrene, flouranthene, pyrene, and benzo(k)fluoranthene.

Sediment sample ST07 was collected a few hundred feet further downgradient at the outlet of the ditch to the Calumet River. Sample analysis revealed the inorganic substance arsenic.

Potential targets of releases to the surface water do not include drinking water users because no municipal water intakes are within the 15-mile downstream distance. The Calumet River has been engineered with a system of locks to flow west, away from municipal water intakes in Lake Michigan. Potential surface water targets include the Calumet River, Little Calumet River, and Calumet Sag Channel. These fresh water rivers are assumed to be recreational fisheries; thus, the human food chain could be affected. These same river segments have approximately 1.5 miles of wetland frontage supporting hydrophytic vegetation, which is included as a sensitive environmental target within the 15 mile downstream target distance. The gun club and Dead Stick Lake include palustrine wetlands with emergent hydrophytic vegetation and are therefore identified as sensitive environment targets. The Whistler Forest Preserve and the Cook County Forest Preserve, which flank the Calumet Sag Channel, also are sensitive environmental targets.

5.4 Air

The potential release area has not been delineated clearly, but concentrations of heavy metals and semivolatile compounds significantly above background concentrations have been identified in sediments and surface soil samples collected near the intersection of 124th Street and Crandon Avenue. Only a thin layer of soil has been documented as a cover for the drum release area. Consequently, it is assumed that the potential for particulate migration exists.

It has been determined that gas migration is possible from the site, but it has not been determined whether the released gases are significant. Volatile compounds other than toluene were not identified analytically in soil, sediment, or surface water samples at concentration significantly above background; however, head space samples were collected near the intersection of 124th Street and Crandon Avenue, and the values recorded indicate gases are released from onsite sediments. Soils are

generally fine-grained, and the sediments are fine-grained, mucky, and saturated. A possible source of the gases, identified using head space analysis, is decomposition of organic material in the mucky sediments.

Within one-quarter mile of the site, potential targets of particulate and gaseous air releases include the human population, a state-designated natural area, and a rookery of federally-endangered birds. The human population is considered to be approximately ten workers at the Stony facility and fifteen people living within a 0.25 mile radius. The site and most of the area within the 0.25 mile radius is included in the Lake Calumet State Natural Area. Northeast of the site is a rookery where the black-crowned night heron, a federally-designated endangered animal, nests.

5.5 Soil

Two surface soil samples (SS01 and SS02) were collected from two onsite locations near the intersection of 124th Street and Crandon Avenue. Sample SS02 was used as background sample and a significant concentration of silver was found in SS01.

Potential target receptors of the TAL substance identified in the surface soil sample include people using the gun club property for hunting or other purposes, people residing within one mile of the site, and sensitive environments within 200 feet of the site. The number of people using, or trespassing on, the gun club property is not known. Both access roads to the gun club are closed with steel cable gates, but roads have been worn around the gate. The Stony facility is fenced (including two sides of the gun club property), so workers at the Stony facility do not have access to soils at the gun club. Approximately 3,540 people live within one mile of the gun club. The only sensitive environment within 200 feet of the site is the Lake Calumet Natural Area, which encompasses the whole site.

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Appendix A

MSD #4 Sludge and Barrel Dump

Site 4-Mile Radius Map
15-Mile Surface Water Route Map

Appendix B

MSD #4 Sludge and Barrel Dump

Target Compound List and
Target Analyte List

Target Compound List

Volatiles

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon Tetrachloride
Bromodichloromethane
1,2-Dichloropropane
Cis-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
trans-1,3-Dichloropropane
Bromoform
4-Methyl-2-pentanone
2-Hexanone
Tetrachloroethene
Toluene
1,1,2,2-Tetrachloroethane
Chlorobenzene
Ethyl benzene
Styrene
Xylenes (total)

Source: Target Compound List for water and soil with low or medium levels of volatile and semi-volatile organic contaminants, as shown in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Target Compound List (Continued)

Semi-Volatiles

Phenol	Acenaphthene
bis(2-Chloroethyl) ether	2,4-Dinitrophenol
2-Chlorophenol	4-Nitrophenol
1,3-Dichlorobenzene	Dibenzofuran
1,4-Dichlorobenzene	2,4-Dinitrotoluene
1,2-Dichlorobenzene	Diethylphthalate
2-Methylphenol	4-Chlorphenyl-phenyl ether
2,2-oxybis-(1-Chloropropane)*	Fluorene
4-Methylphenol	4-Nitroaniline
N-Nitroso-di-n-dipropylamine	4,6-Dinitro-2-methylphenol
Hexachloroethane	N-Nitrosodiphenylamine
Nitrobenzene	4-Bromophenyl-phenyl ether
Isophorone	Hexachlorobenzene
2-Nitrophenol	Pentachlorophenol
2,4-Dimethylphenol	Phenanthrenel
bis(2-Chloroethoxy) methane	Anthracene
2,4-Dichlorophenol	Carbazole
1,2,4-Trichlorobenzene	Di-n-butylphthalate
Naphthalene	Fluoranthene
4-Chloroaniline	Pyrene
Hexachlorobutadiene	Butyl benzyl phthalate
4-Chloro-3-methylhenol	3,3-Dichlorbenzidine
2-Methylnaphthalene	Benzo(a)anthracene
Hexachlorocyclopentadiene	Chrysene
2,4,6-Trichlorophenol	bis(2-Ethylhexyl)phthalate
2,4,5-Trichlorophenol	Di-n-Octyphthalate
2-Chloronephthalene	Benzo(b)fluoranthene
2-Nitroaniline	Benzo(k)fluoranthene
Dimethylphthalate	Benzo(a)pyrene
Acenaphthylene	Indeno(1,2,3-cd)pyrene
2,6-Dinitrotoluene	Dibenzo(a,h)anthracene
3-Nitroaniline	Benzo(g,h,i)perylene

*Previously known by the name of bis(2-chlorousipropyl) ether.

Source: Target Compound List for water and soil with low or medium levels of volatile and semi-volatile organic contaminants, as shown in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Target Compound List (Continued)

Pesticide/PCB

alpha-BHC	4,4-DDT
beta-BHC	Methoxychlor
delta-BHC	Endrin ketone
gamma-BHC (Lindane)	Endrin aldehyde
Heptachlor	alpha-chlordane
Aldrin	gamma-chlordane
Heptachlor epoxide	Toxaphene
Endosulfan I	Aroclor-1016
Dieldrin	Aroclor-1221
4,4-DDE	Aroclor-1232
Endrin	Aroclor-1242
Endosulfan II	Aroclor-1248
4,4-DDD	Aroclor-1254
Endosulfan sulfate	Aroclor-1260

Source: Target Compound List for water and soil containing less than high concentrations of pesticides/aroclors, as shown in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Target Analyte List

Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Chromium	Sodium
Cobalt	Thallium
Copper	Vanadium
Iron	Zinc
Lead	Cyanide

Source: Target Analyte List in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Appendix C

MSD #4 Sludge and Barrel Dump

Analytical Results

Appendix C

Table of Contents

Data Reporting Qualifiers
Definitions for Organic Chemical Data Qualifiers

R - Indicates that the data are unusable. The compound may or may not be present.

U - Indicates compound was analyzed for but not detected. The associated numerical value is the sample quantitation limit.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

N - Indicates presumptive evidence of a compound. This flag is only used for TICs where the identification is based on a mass spectral library search. It is applied to all TIC results. For generic characterization of a TIC, the N code is not used.

P - This flag is used for a pesticide Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported and flagged with a "P".

C - This flag applies to results where identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination. This flag must be used for a TIC as well as for a positively identified TCL compound

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for the specific analysis. This flag will not apply to pesticide/PCBs analyzed by GC/MS methods. If one or more compounds have a response greater than full scale, the sample or extract must be diluted and re-analyzed according to the specifications.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

A - This flag indicates that a TIC is a suspected aldol-condensation product.

X - Other specific flags may be required to properly define the results. The "X" flags are fully described on the data tables.

Data Reporting Qualifiers
Definitions for Inorganic Chemical Data Qualifiers

R - Indicates that the data are unusable. The compound may or may not be present.

U - Indicates compound was analyzed for but not detected. The associated numerical value is the sample quantititaion limit.

J - Indicates an estimated value.

B - Indicates that the reported value is less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).

E - The reported value is estimated because of the presence of interference.

M - Duplicate injection precision criteria not met.

N - Spiked sample recovery not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.

* - Duplicate analysis was not within control limits.
+ - Correlation coefficient for the MSA was less than 0.995.

Volatile Organic Analysis for Sediment Samples MSD #4 Sludge and Barrel Dump Site								
Volatile Compound	Sample Locations and Number / Concentration in ug/kg							
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	ST08
Chloromethane	15 UJ	16 U	15 UJ	32 J	16 UJ	14 U	13 U	17 U
Bromomethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Vinyl Chloride	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Chloroethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Methylene Chloride	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Acetone	15 UJ	16 UJ	15 UJ	26 UJ	16 UJ	14 UJ	13 UJ	17 UJ
Carbon Disulfide	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
1,1-Dichloroethene	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
1,1-Dichloroethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
1,2-Dichloroethene (total)	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Chloroform	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
1,2-Dichloroethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
2-Butanone	15 UJ	16 UJ	15 UJ	26 UJ	16 UJ	14 UJ	13 UJ	17 UJ
1,1,1-Trichloroethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Carbon Tetrachloride	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Bromodichloromethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
1,2-Dichloropropane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
cis-1,3-Dichloropropene	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Trichloroethene	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Dibromochloromethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
1,1,2-Trichloroethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Benzene	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
trans-1,3-Dichloropropene	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Bromoform	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
4-Methyl-2-Pentanone	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
2-Hexanone	15 UJ	16 UJ	15 UJ	26 UJ	16 UJ	14 UJ	13 UJ	17 UJ
Tetrachloroethene	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
1,1,2,2-Tetrachloroethane	15 UJ	16 U	15 UJ	26 UJ	16 UJ	14 U	13 U	17 U
Toluene	15 UJ	16 U	63 J	160 J	16 UJ	14 U	13 U	17 U
Chlorobenzene	15 UJ	16 U	15 UJ	32 J	16 UJ	14 U	13 U	17 U
Ethylbenzene	15 UJ	16 U	15 UJ	29 J	16 UJ	14 U	13 U	17 U
Styrene	15 UJ	16 U	15 UJ	26 U	16 UJ	14 U	13 U	17 U
Xylene (total)	15 UJ	16 U	15 UJ	93 J	16 UJ	14 U	13 U	17 U
Total Number of TICS *	1	1	2	10	2	1	4	2

* Number, not concentrations, of tentatively identified compounds (TICs).

sed-vol

Note: Shaded boxes indicate a rejected background sample.

Volatile Organic Analysis for Sediment Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample ST01(Background)		
Unknown	1.47	25 JB
Sample ST02		
Hexane	4.40	11 UJNB
Sample ST03		
Unknown	1.40	18 UJB
Hexane	4.42	9 UJNB
Sample ST04		
Unknown	1.33	120 J
Heptane, 3-Methyl	11.85	31 JN
Unknown	17.27	59 J
Unknown	17.65	190 J
Unknown	18.37	97 J
Unknown Alkybenzene	18.57	72 J
Unknown Aliphatic	18.95	120 J
Unknown Alkybenzene	19.50	120 J
Unknown Alkylbenzene	20.55	280 J
Unknown Aliphatic	23.25	160 J
Sample ST05		
Unknown	1.37	19 UJB
Hexane	4.43	9 UJNB
Sample ST06		
Hexane	4.40	7 UJNB
Sample ST07		
Hexane	4.40	7 UJNB
Unknown Aliphatic	14.03	4 J
Unknown Aliphatic	16.02	6 J
Unknown Aliphatic	18.97	7 J
Sample ST08		
Unknown	2.52	10 J
Hexane	4.43	10 UJNB

Note: Shaded boxes indicate a rejected background sample.

tic-sved

Semivolatile Organic Analysis for Sediment Samples
MSD #4 Sludge and Barrel Dump

Semivolatile Compound	Sample Location and Number / Concentrations in ug/kg							
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	ST08
Phenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
bis(2-Chloroethyl)Ether	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2-Chlorophenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
1,3-Dichlorobenzene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
1,4-Dichlorobenzene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
1,2-Dichlorobenzene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2-Methylphenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2,2'-oxybis(1-Chloropropane)	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
4-Methylphenol	510 UJ	520 U	510 UJ	530	510 U	460 U	410 UJ	560 U
n-Nitroso-Di-n-Propylamine	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Hexachloroethane	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Nitrobenzene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Isophorone	510 UJ	730	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2-Nitrophenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2,4-Dimethylphenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
bis(2-Chloroethoxy)Methane	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2,4-Dichlorophenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
1,2,4-Trichlorobenzene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Naphthalene	510 UJ	520 U	510 UJ	800	510 U	460 U	410 UJ	560 U
4-Chloroaniline	510 UJ	520 UJ	510 UJ	380 UJ	510 UJ	460 UJ	410 UJ	560 UJ
Hexachlorobutadiene	510 UJ	520 UJ	510 UJ	380 UJ	510 UJ	460 UJ	410 UJ	560 UJ
4-Chloro-3-Methylphenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2-Methylnaphthalene	510 UJ	520 U	510 UJ	580	510 U	460 U	410 UJ	560 U
Hexachlorocyclopentadiene	510 UJ	520 UJ	510 UJ	380 UJ	510 UJ	460 UJ	410 UJ	560 UJ
2,4,6-Trichlorophenol	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2,4,5-Trichlorophenol	1200 UJ	1300 U	1200 UJ	930 U	1200 U	1100 U	1000 UJ	1400 U

Semivolatile Organic Analysis for Sediment Samples
MSD #4 Sludge and Barrel Dump

Semivolatile Compound	Sample Location and Number / Concentrations in ug/kg							
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	ST08
2-Chloronaphthalene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2-Nitroaniline	1200 UJ	1300 U	1200 UJ	930 U	1200 U	1100 U	1000 UJ	1400 U
Dimethyl Phthalate	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Acenaphthylene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
2,6-Dinitrotoluene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
3-Nitroaniline	1200 UJ	1300 UJ	1200 UJ	930 UJ	1200 UJ	1100 UJ	1000 UJ	1400 UJ
Acenaphthene	510 UJ	520 U	510 UJ	770	510 U	460 U	410 UJ	560 U
2,4-Dinitrophenol	1200 UJ	1300 U	1200 UJ	930 U	1200 U	1100 UJ	1000 UJ	1400 U
4-Nitrophenol	1200 UJ	1300 U	1200 UJ	930 U	1200 U	1100 UJ	1000 UJ	1400 U
Dibenzofuran	510 UJ	520 U	510 UJ	800	510 U	460 U	410 UJ	560 U
2,4-Dinitrotoluene	510 UJ	520 UJ	510 UJ	380 UJ	510 UJ	460 U	410 UJ	560 UJ
Diethylphthalate	510 UJ	1300	660	380 U	510 U	460 U	410 UJ	560 U
4-Chlorophenyl-phenylether	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Fluorene	510 UJ	520 U	510 UJ	1300	510 U	460 U	410 UJ	560 U
4-Nitroaniline	1200 UJ	1300 U	1200 UJ	930 UJ	1200 UJ	1100 UJ	1000 UJ	1400 UJ
4,6-Dinitro-2-Methylphenol	1200 UJ	1300 U	1200 UJ	930 U	1200 U	1100 U	1000 UJ	1400 U
n-Nitrosodiphenylamine	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
4-Bromophenyl-phenylether	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Hexachlorobenzene	510 UJ	520 U	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Pentachlorophenol	1200 UJ	1300 UJ	1200 UJ	930 UJ	1200 UJ	1100 UJ	1000 UJ	1400 UJ
Phenanthrene	510 UJ	520 U	510 UJ	26000 D	510 U	1800	810 J	1700
Anthracene	510 UJ	520 U	510 UJ	1800	510 U	460 U	410 UJ	560 U
Carbazole	510 RU	520 RU	510 UJ	2300 J	510 RU	460 RU	410 RU	560 RU
di-n-Butylphthalate	510 UJ	2200	510 UJ	380 U	510 U	460 U	410 UJ	560 U
Fluoranthene	510 UJ	520 U	510 UJ	38000 D	560	2300	840 J	2600
Pyrene	510 UJ	520 U	510 UJ	34000 D	610	2000	870 J	2200

Semivolatile Organic Analysis for Sediment Samples
MSD #4 Sludge and Barrel Dump

Semivolatile Compound	Sample Location and Number / Concentrations in ug/kg							
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	ST08
Butylbenzylphthalate	510 UJ	520 U	1000	380 U	510 U	460 UJ	410 UJ	560 U
3,3'-Dichlorobenzidine	510 UJ	520 UJ	510 UJ	380 UJ	510 UJ	460 UJ	410 UJ	560 UJ
Benzo(a)Anthracene	510 UJ	520 U	510 UJ	16000 D	510 U	960	410 UJ	1500
Chrysene	510 UJ	520 U	510 UJ	14000 D	510 U	920	410 UJ	1500
bis(2-Ethylhexyl)Phthalate	710 UJB	930 UB	770 UJB	15000 UBD	610 UB	790 UB	430 UJB	1100 UB
di-n-Octyl Phthalate	510 UJ	520 U	510 UJ	380 UJ	510 U	460 U	410 UJ	560 U
Benzo(b)Fluoranthene	510 UJ	520 U	510 UJ	1600 J	870	460 U	410 UJ	560 U
Benzo(k)Fluoranthene	510 UJ	520 UJ	510 UJ	1100 J	510 UJ	1400	410 UJ	2900 J
Benzo(a)Pyrene	510 UJ	520 U	510 UJ	1100 J	510 U	720	410 UJ	1400
Indeno(1,2,3-cd)Pyrene	510 UJ	520 U	510 UJ	380 UJ	510 U	460 U	410 UJ	900
Dibenzo(a,h)Anthracene	510 UJ	520 U	510 UJ	380 UJ	510 U	460 U	410 UJ	560 U
Benzo(g,h,i)Perylene	510 UJ	520 U	510 UJ	380 UJ	510 U	470 J	410 UJ	880
Total Number of TICs	14	16	18	19	17	17	20	18

Note: Shaded boxes indicate a rejected background sample.

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Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample ST01 (Background)		
Unknown	9.77	250 J
Unknown	9.77	23000 UJB
Unknown	34.00	1500 J
Unknown	34.93	640 J
Unknown	35.28	130 J
Unknown	35.30	120 J
Unknown	35.48	210 J
Unknown	35.58	79 J
Unknown	35.67	57 J
Unknown	35.82	3400 JB
Unknown	36.15	140 J
Unknown	36.50	93 J
Unknown	36.75	550 J
Unknown	37.82	8100 J
Sample ST02		
Unknown Ketone	9.15	25000 UJB
Unknown	12.60	210 J
Unknown	32.37	360 UJB
Unknown	32.40	150 J
Unknown	33.30	660 J
Unknown	34.23	440 J
Unknown	34.62	140 J
Unknown	35.13	790 JB
Unknown	35.33	56 J
Unknown	35.38	75 J
Unknown	35.47	75 J
Unknown	35.48	130 J
Unknown	35.78	260 J
Unknown	36.00	390 J
Unknown	36.43	310 J
Unknown	36.95	1800 J
Sample ST03		
Unknown Ketone	9.12	29000 UJB
Unknown	10.80	530 UJB
Unknown	11.55	810 JB
Unknown	12.58	1000 J
Unknown	13.93	290 J
Unknown	27.70	1000 J
Unknown HC	33.30	530 J
Unknown HC	35.12	1000 J
Unknown	35.98	320 J
Unknown	36.42	1100 J
Unknown	36.93	2800 J

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample ST03 (Continued)		
Unknown	37.45	240 J
Unknown	37.48	180 J
Unknown	37.70	200 J
Unknown	38.60	340 J
Unknown	39.23	2100 J
Unknown	39.23	2000 J
Unknown	43.27	54 J
Sample ST04		
Unknown Ketone	9.20	23000 UJB
Unknown	27.05	7400 J
Unknown	29.35	4400 J
Unknown	29.52	6200 J
Unknown	29.78	830 J
Unknown Alcohol	30.42	3400 J
Unknown	30.47	1100 J
Unknown	30.82	4700 J
Unknown	31.07	2200 J
Unknown	31.45	4000 J
Unknown	31.47	2900 J
Unknown	31.65	3000 J
Unknown	31.72	1600 J
Unknown	31.78	260 J
Unknown	31.80	1800 J
Unknown	31.90	990 J
Unknown	32.20	1600 J
Unknown	32.43	4400 JB
Unknown	33.38	6200 J
Sample ST05		
Unknown Ketone	9.20	30000 UJB
Unknown	29.30	240 J
Unknown	30.37	880 J
Unknown	30.77	570 J
Unknown	31.38	1200 J
Unknown	31.55	100 J
Unknown	31.58	260 J
Unknown	32.13	260 J
Unknown	32.27	230 J
Unknown	32.38	850 UJB
Unknown	32.38	600 J
Unknown	32.38	610 J
Unknown	32.53	82 J
Unknown	33.32	140 J
Unknown	33.33	1500 J
Unknown	34.25	840 J
Unknown	35.13	1200 JB

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample ST06		
Unknown Ketone	9.35	23000 UJB
Unknown	12.75	300 J
Unknown	24.70	760 J
Unknown	27.87	880 J
Unknown PAH	30.53	320 J
Unknown	31.52	410 J
Unknown PAH	31.55	440 J
Unknown	32.50	360 UJB
Unknown	33.47	600 J
Unknown	34.38	360 J
Unknown	35.27	770 JB
Unknown	35.65	110 J
Unknown	36.15	270 J
Unknown	36.60	730 J
Unknown	37.13	1700 J
Unknown	37.23	200 J
Unknown	41.28	870 J
Sample ST07		
Unknown Ketone	9.15	20000 UJB
Unknown HC	12.82	1900 J
Unknown HC	14.92	2800 J
Unknown HC	18.55	2200 J
Unknown	19.82	900 J
Unknown	20.17	1700 J
Unknown	20.40	720 J
Unknown	21.13	1100 J
Unknown HC	21.68	2000 J
Unknown HC	23.12	1700 J
Unknown	23.80	1200 J
Unknown HC	24.48	2600 J
Unknown	24.58	4100 J
Unknown	25.77	1800 J
Unknown	25.92	1700 J
Unknown HC	27.00	1800 J
Unknown HC	28.17	1500 J
Unknown	29.28	1300 J
Unknown	30.35	1400 J
Unknown	31.38	1200 J

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample ST08		
Unknown Ketone	9.15	33000 UJB
Unknown HC	26.20	400 J
Unknown	28.52	320 J
Unknown	29.77	140 J
Unknown	30.82	130 J
Unknown	31.38	820 J
Unknown	33.30	400 J
Unknown	33.32	1200 J
Unknown PAH	34.02	1800 J
Unknown	34.02	160 J
Unknown	35.12	280 UJB
Unknown	35.13	1500 J
Unknown	35.48	76 J
Unknown	35.50	88 J
Unknown	36.02	410 J
Unknown	36.95	4400 J
Unknown	37.13	170 J
Unknown PAH	37.97	1300 J

Note: Shaded boxes indicate a rejected background sample. tic-sed

Pesticide/Pesticide/PCB Analysis for Sediment Samples MSD #4 Sludge and Barrel Dump								
Pesticide/ PCB	Sample Location and Number / Concentrations in ug/kg							
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	ST08
Alpha-BHC	2.6 UJ	2.6 UJ	2.6 UJ	420 RUJ	260 RUJ	240 RUJ	210 RUJ	290 RUJ
Beta-BHC	2.6 UJ	2.6 UJ	2.6 UJ	420 RUJ	260 RUJ	240 RUJ	210 RUJ	290 RUJ
Delta-BHC	2.6 UJ	2.6 UJ	2.6 UJ	420 RUJ	260 RUJ	240 RUJ	210 RUJ	290 RUJ
Gamma-BHC (Lindane)	2.6 UJ	2.6 UJ	2.6 UJ	420 RUJ	260 RUJ	240 RUJ	210 RUJ	290 RUJ
Heptachlor	2.6 UJ	2.6 UJ	2.6 UJ	420 RU	260 RU	240 RUJ	210 RUJ	290 RU
Aldrin	2.6 UJ	2.6 UJ	2.6 UJ	420 RU	260 RU	240 RUJ	210 RUJ	290 RU
Heptachlor Epoxide	2.6 UJ	2.6 UJ	2.6 UJ	420 RU	260 RU	240 RUJ	210 RUJ	290 RU
Endosulfan I	2.6 UJ	2.6 UJ	2.6 UJ	420 RU	260 RU	240 RUJ	210 RUJ	290 RU
Dieldrin	2.3 JP	2.1 JP	0.50 JP	820 RU	510 RU	460 RUJ	410 RUJ	560 RU
4,4'-DDE	2.5 J	51 J	54 J	820 RU	510 RU	460 RUJ	410 RUJ	560 RU
Endrin	5.0 UJ	5.1 UJ	5.0 UJ	820 RUJ	510 RUJ	460 RUJ	410 RUJ	560 RUJ
Endosulfan II	5.0 UJ	5.1 UJ	5.0 UJ	820 RU	510 RU	460 RUJ	410 RUJ	560 RU
4,4'-DDD	3.8 J	37 J	47 J	67 JD	510 RUJ	460 RUJ	410 RUJ	560 RUJ
Endosulfan Sulfate	5.0 UJ	5.1 UJ	5.0 UJ	820 RU	510 RU	460 RUJ	410 RUJ	560 RU
4,4'-DDT	4.1 JP	11 JP	12 JP	820 RU	510 RU	460 RUJ	410 RUJ	560 RU
Methoxychlor	26 UJ	26 UJ	26 UJ	4200 RUJ	2600 RUJ	2400 RUJ	2100 RUJ	2900 RU
Endrin Ketone	5.0 UJ	5.1 UJ	5.0 UJ	820 RU	510 RU	460 RUJ	410 RUJ	560 RU
Endrin Aldehyde	5.0 UJ	5.1 UJ	5.0 UJ	820 RU	510 RU	460 RUJ	410 RUJ	560 RU
Alpha-Chlordane	2.6 UJ	1.4 JP	2.6 UJ	420 RU	260 RU	240 RUJ	210 RUJ	290 RU
Gamma-Chlordane	0.61 JP	3.2 JP	2.6 UJ	420 RU	260 RU	240 RUJ	210 RUJ	290 RU
Toxaphene	260 UJ	260 UJ	260 UJ	42000 RU	26000 RU	24000 RUJ	21000 RUJ	29000 RU
Aroclor-1016	50 UJ	51 UJ	50 UJ	8200 RU	5100 RU	4600 RUJ	4100 RUJ	5600 RU
Aroclor-1221	100 UJ	100 UJ	100 UJ	17000 RU	10000 RU	9400 RUJ	8400 RUJ	11000 RU
Aroclor-1232	50 UJ	51 UJ	50 UJ	8200 RU	5100 RU	4600 RUJ	4100 RUJ	5600 RU
Aroclor-1242	50 UJ	51 UJ	50 UJ	8200 RU	5100 RU	4600 RUJ	4100 RUJ	5600 RU
Aroclor-1248	61 JP	92 JP	50 UJ	10000	5100 RU	4600 RUJ	4100 RUJ	5600 RU
Aroclor-1254	68 J	51 UJ	50 UJ	8200 RU	5100 RU	4600 RUJ	4100 RUJ	5600 RU
Aroclor-1260	50 UJ	75 J	50 UJ	6100 JP	5100 RU	4600 RUJ	4100 RUJ	5600 RU

Note: Shaded boxes indicate a rejected background sample.

Inorganic Analysis for Sediment Samples MSD #4								
Metals and Cyanide	Sample Locations and Number Concentrations in mg/kg							
	ST01 Background	ST02	ST03	ST04	ST05	ST06	ST07	ST08
Aluminum	3430	5150	4510	12300	6380	2020	4110	14600
Antimony	4.6 UJN	4.7 UJN	4.0 UJN	7.4 UJN	4.2 UJN	4.4 UJN	3.9 UJN	5.0 UJN
Arsenic	3.6	3.8	3.6	10.1	10.0	3.2	17.6	2.8 B
Barium	38.4 B	61.5	40.7 B	518	59.5	18.8 B	28.9 B	214
Beryllium	0.57 B	0.60 B	0.59 B	1.1 B	0.54 B	0.34 U	0.39 B	3.4
Cadmium	1.1 B	2.9	0.38 U	6.9	0.40 U	0.44 B	0.37 U	0.93 B
Calcium	45900	37500	27800	91600	60000	55100	50700	1E+05
Chromium	36.9	62.9	10.2	193	49.0	16.0	9.0	34.6
Cobalt	4.1 B	5.5 B	4.7 B	9.8 B	5.9 B	2.9 B	8.0 B	2.2 B
Copper	23.8	40.5	11.7	206	32.0	15.9	26.5	29.4
Iron	9990	12500	9580	40200	23100	7380	20400	9130
Lead	23.2	44.4	20.7	251	73.0	20.7	22.7	38.7
Magnesium	19200	17900	12900	32300	26400	27700	27400	25600
Manganese	463 JN	469 JN	220 JN	1720 JN	1350 JN	248 JN	534 JN	1310 JN
Mercury	0.07 U	0.09 B	0.06 U	0.77	0.13	0.07 U	0.06 U	0.08 U
Nickel	13.1	17.2	10.4	45.1	20.1	8.3 B	19.9	7.0 B
Potassium	956 B	771 B	679 B	2430	1520	501 B	892 B	1210 B
Selenium	0.68 U	0.69 U	0.67 B	2.4	0.61 U	0.65 U	0.57 U	2.1
Silver	1.5 U	1.5 U	1.3 U	5.6	1.3 U	1.4 U	1.2 U	1.6 U
Sodium	390 B	92.6 B	81.1 B	1380 B	219 B	258 B	171 B	1130 B
Thallium	0.84 UJW	0.92 U	0.79 U	1.5 U	0.75 U	0.83 U	0.68 U	0.97 UJW
Vanadium	15.8	21.6	14.3	50.7	23.3	7.6 B	12.2 B	13.6 B
Zinc	87.2	137	50.5	687	494	55.2	124	200
Cyanide	0.70 U	0.76 U	0.65 U	1.8	0.66 U	0.71 U	0.60 U	0.82 U

Note: Shaded boxes indicate a rejected background sample.

Volatile Organic Analysis for Surface Water Samples MSD #4 Sludge and Barrel Dump				
Volatile Compound	Sample Locations and Number Concentrations in ug/L			
	SW01	SW02	SW03	SW04 Background
Chloromethane	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U
Methylene Chloridë	10 U	10 U	10 U	10 U
Acetone	40 J	21 J	10 UJ	39 J
Carbon Disulfide	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 UJ	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U
2-Butanone	10 UJ	10 UJ	10 UJ	10 UJ
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10 U	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U
Benzene	10 U	10 UJ	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U
Toluene	10 U	10 UJ	14	10 U
Chlorobenzene	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U
Styrene	10 U	10 U	10 U	10 U
Xylene (total)	10 U	10 U	10 U	10 U
Total Number of TICS *	1	0	2	0

* Number, not concentrations, of tentatively identified compounds (TICs).

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Volatile Organic Analysis for Surface Water Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/L		
Compound Name	Retention Time	Estimated Concentration
Sample SW01		
Unknown	18.92	11 J
Sample SW02		
Acetic acid, methyl ester	3.32	8 JN
Hexane	4.47	5 UJN

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Semivolatile Organic Analysis for Surface Water Samples
MSD #4 Sludge and Barrel Dump

Semivolatile Compound	Sample Location and Number Concentrations in ug/L			
	SW01	SW02	SW03	SW04 Background
Phenol	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)Ether	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10 U	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U	10 U
n-Nitroso-Di-n-Propylamine	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U	10 U
2-Nitrophenol	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)Methane	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U	10 U
4-Chloroaniline	10 UJ	10 UJ	10 UJ	10 UJ
Hexachlorobutadiene	10 UJ	10 UJ	10 UJ	10 UJ
4-Chloro-3-Methylphenol	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50 U	50 U	50 U	50 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U
2-Nitroaniline	50 U	50 U	50 U	50 U
Dimethyl Phthalate	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U
3-Nitroaniline	50 UJ	50 UJ	50 UJ	50 UJ
Acenaphthene	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	50 U	50 U	50 U	50 U
4-Nitrophenol	50 UJ	50 UJ	50 UJ	50 UJ
Dibenzofuran	10 U	10 U	10 U	10 U
2,4-Dinitrotoluene	10 U	10 UJ	10 U	10 U
Diethylphthalate	10 U	10 U	10 U	10 U

Semivolatile Organic Analysis for Surface Water Samples (Continued)
MSD #4 Sludge and Barrel Dump

Semivolatile Compound	Sample Location and Number Concentrations in ug/L			
	SW01	SW02	SW03	SW04 Background
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U
4-Nitroaniline	50 UJ	50 UJ	50 UJ	50 U
4,6-Dinitro-2-Methylphenol	50 U	50 U	50 U	50 U
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 UJ	10 UJ	10 UJ	10 U
Pentachlorophenol	50 UJ	50 UJ	50 UJ	50 UJ
Phenanthrene	10 U	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U	10 U
Carbazole	10 U	10 UJ	10 UJ	10 UJ
di-n-Butylphthalate	10 UJB	10 UJB	10 UJB	10 UJB
Fluoranthene	10 U	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	20 UJ	20 UJ	20 UJ	20 UJ
Benzo(a)Anthracene	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)Phthalate	10 U	10 U	10 U	10 U
di-n-Octyl Phthalate	10 U	10 U	10 U	10 U
Benzo(b)Fluoranthene	10 U	10 U	10 U	10 U
Benzo(k)Fluoranthene	10 UJ	10 UJ	10 UJ	10 U
Benzo(a)Pyrene	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U	10 U
Dibenzo(a,h)Anthracene	10 U	10 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	10 U	10 U	10 UJ
Total Number of TICs *	7	9	14	10

* Number, not concentration, of tentatively identified compounds (TICs).

sw-semiv

Semivolatile Organic Analysis for Surface Water Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/L		
Compound Name	Retention Time	Estimated Concentration
Sample SW01		
Unknown ketone	7.50	6 UJB
Unknown ketone	8.78	11 UJB
Unknown aldehyde	9.32	3 UJB
Unknown	10.38	2 J
Unknown subst. benzamide	23.15	2 J
Unknown	27.73	3 J
Unknown	32.43	8 UJB
Sample SW02		
Unknown ketone	7.53	5 UJB
Unknown ketone	8.82	11 UJB
Unknown aldehyde	9.33	2 UJB
Unknown HC	16.03	4 J
Unknown ester	23.30	4 UJB
Unknown	27.75	2 J
Unknown	27.77	4 J
Unknown	28.35	3 UJB
Unknown ester	32.47	11 UJB
Sample SW03		
Unknown ketone	7.53	6 UJB
Unknown ketone	8.82	11 UJB
Unknown aldehyde	9.33	3 UJB
Unknown	16.03	4 UJB
Unknown	16.10	3 J
Unknown acid	18.58	7 J
Unknown	20.93	4 J
Unknown	24.07	2 J
Unknown	25.92	12 J
Unknown acid	27.75	4 J
Unknown	28.35	3 UJB
Unknown	28.85	3 J
Unknown acid	32.47	7 UJB
Unknown	36.48	5 J
Sample SW04 (Background)		
Unknown ketone	7.47	5 UJB
Unknown ketone	8.75	34 UJB
Unknown aldehyde	9.27	9 UJB
Unknown ketone	15.97	17 UJB
Unknown ester	28.23	3 UJB
Unknown ester	32.40	4 UJB
Unknown	33.30	5 J
Unknown	34.23	5 J
Unknown	35.13	8 J
Unknown	36.95	17 J

SW-TICS

Pesticide/Pcb Analysis for Surface Water Samples MSD #4 Sludge and Barrel Dump				
Pesticide/ PCB	Sample Locations and Number Concentrations in ug/L			
	SW01	SW02	SW03	SW04 Background
Alpha-BHC	0.050 UJ	0.050 UJ	0.050 UJ	0.050 UJ
Beta-BHC	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Delta-BHC	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Gamma-BHC (Lindane)	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Heptachlor	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Aldrin	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Heptachlor Epoxide	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Endolsulfan I	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Dieldrin	0.10 UJ	0.10 U	0.10 UJ	0.10 U
4,4'-DDE	0.10 UJ	0.10 U	0.10 UJ	0.10 U
Endrin	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ
Endosulfan II	0.10 UJ	0.10 U	0.10 UJ	0.10 U
4,4'-DDD	0.10 UJ	0.10 U	0.014 UJ	0.10 U
Endosulfan Sulfate	0.10 UJ	0.10 U	0.10 UJ	0.10 U
4,4'-DDT	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ
Methoxychlor	0.50 UJ	0.50 U	0.50 UJ	0.50 U
Endrin Ketone	0.10 UJ	0.10 U	0.10 UJ	0.10 U
Endrin Aldehyde	0.10 UJ	0.10 U	0.10 UJ	0.10 U
Alpha-Chlordane	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Gamma-Chlordane	0.050 UJ	0.050 U	0.050 UJ	0.050 U
Toxaphene	5.0 UJ	5.0 U	5.0 UJ	5.0 U
Aroclor-1016	1.0 UJ	1.0 U	1.0 UJ	1.0 U
Aroclor-1221	2.0 UJ	2.0 U	2.0 UJ	2.0 U
Aroclor-1232	1.0 UJ	1.0 U	1.0 UJ	1.0 U
Aroclor-1242	1.0 UJ	1.0 U	1.0 UJ	1.0 U
Aroclor-1248	1.0 UJ	1.0 U	1.0 UJ	1.0 U
Aroclor-1254	1.0 UJ	1.0 U	1.0 UJ	1.0 U
Aroclor-1260	1.0 UJ	1.0 U	1.0 UJ	1.0 U

swpest

Inorganic Analysis for Surface Water Samples MSD #4 Sludge and Barrel Dump				
Metals and Cyanide	Sample Locations and Number Concentrations in ug/L			
	SW01	SW02	SW03	SW04 Background
Aluminum	255 J	336 J	9250 J	519 J
Antimony	17.9 U	17.9 U	17.9 U	17.9 U
Arsenic	2.7 U	2.7 U	5.4 B	2.7 UJW
Barium	89.0 JBE	57.9 JBE	125 JBE	60.3 JBE
Beryllium	0.40 U	0.40 U	0.73 B	0.40 U
Cadmium	1.5 U	1.5 U	1.5 U	1.5 U
Calcium	50400 J	77800 J	90600 J	47800 J
Chromium	2.3 UB	5.2 UB	18.0 U	5.5 UB
Cobalt	3.2 B	1.5 U	9.5 B	1.5 U
Copper	6.5 UB	5.2 UB	26.4 J	13.3 JB
Iron	737 J	1470 J	16700 J	1580 J
Lead	4.1	3.9	49.0 S	15.3 S
Magnesium	55700 J	18000 J	26500 J	14800 J
Manganese	82.1 J	1520 J	928 J	470 J
Mercury	0.10 B	0.25	0.10 U	0.10 U
Nickel	10.9 B	4.1 B	21.7 B	3.7 U
Potassium	55600	7070	18800	4280 B
Selenium	3.7 UJNW	3.7 UJNW	18.5 UJNW	3.7 UJN
Silver	3.4 U	3.4 U	3.4 U	3.4 U
Sodium	3E+05 J	6440 J	5540 J	14000 J
Thallium	2.0 UJNW	2.0 UJNW	2.0 UJNW	2.0 UJNW
Vanadium	3.5 B	2.3 U	21.4 B	2.6 B
Zinc	39.8 J	23.5 U	127 J	38.2 J
Cyanide	50.3	10.0 U	10.0 U	10.0 U

swmetals

Volatile Organic Analysis for Surface Soil Samples MSD #4 Sludge and Barrel Dump			
Volatile Compound	Sample Locations and Number Concentrations in ug/kg		
	SS01	SS02 Background	SS03
Chloromethane	13 UJ	12 UJ	11 UJ
Bromomethane	13 U	12 U	11 U
Vinyl Chloride	13 U	12 U	11 U
Chloroethane	13 U	12 U	11 U
Methylene Chloride	23 UB	12 U	11 UJB
Acetone	13 U	12 UJ	11 UJ
Carbon Disulfide	1 J	12 UJ	11 UJ
1,1-Dichloroethene	13 U	12 UJ	11 UJ
1,1-Dichloroethane	13 U	12 U	11 U
1,2-Dichloroethene (total)	13 U	12 U	11 U
Chloroform	13 U	12 U	11 U
1,2-Dichloroethane	13 U	12 U	11 UJ
2-Butanone	13 U	12 U	11 U
1,1,1-Trichloroethane	1 J	2 J	11 U
Carbon Tetrachloride	13 U	12 U	11 U
Bromodichloromethane	13 U	12 U	11 U
1,2-Dichloropropane	13 U	12 U	11 U
cis-1,3-Dichloropropene	13 U	12 U	11 U
Trichloroethene	13 U	12 U	11 U
Dibromochloromethane	13 U	12 U	11 U
1,1,2-Trichloroethane	13 U	12 U	11 U
Benzene	13 U	12 U	11 U
trans-1,3-Dichloropropene	13 U	12 U	11 U
Bromoform	13 U	12 U	11 U
4-Methyl-2-Pentanone	13 UJ	12 UJ	11 U
2-Hexanone	13 UJ	12 UJ	11 UJ
Tetrachloroethene	13 UJ	12 UJ	7 J
1,1,2,2-Tetrachloroethane	13 UJ	12 UJ	11 U
Toluene	1 JB	12 UJ	6 J
Chlorobenzene	2 J	12 UJ	11 U
Ethylbenzene	13 UJ	12 UJ	11 U
Styrene	13 UJ	12 UJ	11 U
Xylene (total)	13 UJ	12 UJ	11 U
Total Number of TICs *	2	4	5

* Number, not concentrations, of tentatively identified compounds (TICs).

Note: Shaded boxes indicate a rejected background sample

Volatile Organic Analysis for Soil Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample SS01		
C6H12 hydrocarbon	8.40	9 J
Cyclotetrasiloxane, octameth.	21.69	7 JN
Sample SS02 (Background)		
Ethane, 1,1,2-trichloro-1,2,	3.97	37 JN
C6H12 hydrocarbon	8.41	10 J
Hexamethylcyclotrisiloxane	15.64	10 JN
Cyclotetrasiloxane, octameth.	21.70	9 JN
Sample SS03		
Ethane, 1,1,2-trichloro-1,2,	4.03	32 JN
C7H16 hydrocarbon	8.81	16 J
C7H14 hydrocarbon	9.62	7 J
C7H14 hydrocarbon	10.94	11 J
Cyclotetrasiloxane, hexamethyl	15.65	6 UJNB

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Note: Shaded boxes indicate a rejected background sample.

Semivolatile Organic Analysis for Surface Soil Samples
MSD #4 Sludge and Barrel Dump

Semivolatile Compound	Sample Location and Number / Concentrations in ug/kg		
	SS01	SS02 Background	SS03
Phenol	420 U	390 UJ	370 U
bis(2-Chloroethyl)Ether	420 U	390 U	370 U
2-Chlorophenol	420 U	390 UJ	370 U
1,3-Dichlorobenzene	230 U	210 U	200 U
1,4-Dichlorobenzene	420 U	390 UJ	370 U
1,2-Dichlorobenzene	420 U	390 U	370 U
2-Methylphenol	420 U	390 U	370 U
2,2'-oxybis(1-Chloropropane)	420 U	390 U	370 U
4-Methylphenol	420 U	390 U	370 U
n-Nitroso-Di-n-Propylamine	420 U	390 U	370 U
Hexachloroethane	420 U	390 U	370 U
Nitrobenzene	420 U	390 U	370 U
Isophorone	420 U	390 U	370 U
2-Nitrophenol	420 U	390 U	370 U
2,4-Dimethylphenol	420 U	390 U	370 U
bis(2-Chloroethoxy)Methane	420 U	390 U	370 U
2,4-Dichlorophenol	420 U	390 U	370 U
1,2,4-Trichlorobenzene	420 U	390 UJ	370 U
Naphthalene	420 U	390 U	52 J
4-Chloroaniline	420 UJ	390 UJ	370 UJ
Hexachlorobutadiene	420 U	390 U	370 U
4-Chloro-3-Methylphenol	420 U	390 UJ	370 U
2-Methylnaphthalene	420 U	390 U	50 J
Hexachlorocyclopentadiene	420 U	390 U	370 U
2,4,6-Trichlorophenol	420 U	390 U	370 U
2,4,5-Trichlorophenol	420 U	390 U	370 U
2-Chloronaphthalene	420 U	390 U	370 U
2-Nitroaniline	1000 U	940 U	890 U
Dimethyl Phthalate	420 U	390 U	370 U
Acenaphthylene	420 U	390 U	370 U
2,6-Dinitrotoluene	420 U	390 U	370 U
3-Nitroaniline	1000 U	940 UJ	890 U
Acenaphthene	420 U	390 UJ	130 J
2,4-Dinitrophenol	1000 U	940 U	890 U
4-Nitrophenol	1000 U	940 U	890 U
Dibenzofuran	420 U	390 U	90 J
2,4-Dinitrotoluene	420 U	390 U	370 U
Diethylphthalate	420 U	390 U	370 U
4-Chlorophenyl-phenylether	420 U	390 U	370 U
Fluorene	420 U	390 U	140 J

Semivolatile Organic Analysis for Surface Soil Samples
MSD #4 Sludge and Barrel Dump

Semivolatile Compound	Sample Location and Number / Concentrations in ug/kg		
	SS01	SS02 Background	SS03
4-Nitroaniline	1000 UJ	940 UJ	890 U
4,6-Dinitro-2-Methylphenol	1000 U	940 UJ	890 U
n-Nitrosodiphenylamine	420 U	390 U	370 U
4-Bromophenyl-phenylether	420 U	390 U	370 U
Hexachlorobenzene	420 U	390 U	370 U
Pentachlorophenol	1000 U	940 U	890 U
Phenanthrene	300 J	100 J	1600
Anthracene	55 J	390 U	360 J
Carbazole	83 J	390 U	450
di-n-Butylphthalate	420 U	390 U	370 U
Fluoranthene	430	170 J	2400
Pyrene	610 B	390 UJB	3300 B
Butylbenzylphthalate	47 J	390 U	270 J
3,3'-Dichlorobenzidine	420 UJ	390 UJ	370 UJ
Benzo(a)Anthracene	360 J	130 J	2000
Chrysene	300 J	130 J	1500
bis(2-Ethylhexyl)Phthalate	420 UJB	390 UJ	690 UB
di-n-Octyl Phthalate	420 U	390 U	170 J
Benzo(b)Fluoranthene	500	230 J	2900
Benzo(k)Fluoranthene	420 U	390 U	370 U
Benzo(a)Pyrene	230 J	110 J	1400
Indeno(1,2,3-cd)Pyrene	230 J	110 J	690 JD
Dibenzo(a,h)Anthracene	420 U	390 U	1100 U
Benzo(g,h,i)Perylene	240 J	110 J	1400
Total Number of TICs*	23	23	23

* Number, not concentrations, of tentatively identified compounds (TICs).
Note: Shaded boxes indicate a rejected background sample.

Semivolatile Organic Analysis for Surface Soil Samples Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample SS01		
Benzene, methyl-	3.96	240 J
Unknown ketone or ester	4.82	1920 UJB
4-Hydroxy-4-methyl-2-pentano	5.21	19400 UJBNA
Unknown ketone or ester	6.20	144 UJB
C9H20 hydrocarbon	6.41	660 J
5-Hexen-2-one, 5-methyl-	6.71	440 JN
Unknown	7.23	380 J
Unknown ketone or ester	8.53	1340 J
Unknown Hydrocarbon	14.58	136 J
Unknown Hydrocarbon	16.98	178 J
Heptadecane	17.60	200 JN
Heptadecane, 2,6-dimethyl-	17.66	260 JN
Unknown Hydrocarbon	18.87	188 J
C19H40 hydrocarbon	19.84	174 J
9-Hexadecenoic acid	20.46	1020 JN
Hexadecanoic acid	20.64	500 JN
Unknown hydrocarbon and Unknown	21.07	160 J
Unknown hydrocarbon	22.46	220 J
Unknown hydrocarbon	27.13	152 J
Unknown hydrocarbon	28.91	300 UJB
Unknown hydrocarbon	29.07	148 J
Unknown hydrocarbon	31.24	2600 UJB
Unknown	31.24	260 J
Sample SS02 (Background)		
Benzene, methyl-	3.95	194 UJBN
Unknown ketone or ester	4.79	1140 JN
4-Hydroxy-4-methyl-2-pentano	5.20	15600 UJBNA
C9H20 hydrocarbon	6.40	820 J
5-Hexen-2-one, 5-methyl-	6.71	360 JN
Unknown ketone or ester	8.52	1120 J
Quinoline, 2,3-dimethyl-	14.63	260 JN
C15H12 hydrocarbon and Hexad.	20.57	154 J
1,1'-Biphenyl, pentachloro.	22.49	1840 JN
Unknown hydrocarbon	22.86	860 J
Unknown hydrocarbon	23.79	1020 J
C17H12 hydracarbon and Unknown	24.08	500 J
Unknown hydrocarbon	24.68	840 J
Unknown hydrocarbon	24.97	580 J
Unknown hydrocarbon	25.52	1560 J
Unknown hydrocarbon	26.33	920 J
Unknown hydrocarbon	27.12	2600 J
Unknown hydrocarbon	27.92	880 J
Unknown hydrocarbon	28.87	4000 UJM
Unknown	29.04	960 J
Unknown hydrocarbon	31.21	3000 UJB
Unknown hydrocarbon	34.50	480 J
Unknown	36.23	2800 J

Semivolatile Organic Analysis for Surface Soil Samples (Continued) Tentatively Identified Compounds MSD #4 Sludge and Barrel Dump Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample SS03		
Benzene, methyl-	3.97	300 UJBN
Unknown ketone or ester	4.83	1440 UJB
2-Pentanone, 4-hydroxy-4-met	5.24	17400 UJNBA
Unknown ketone or ester	6.19	106 UJB
C9H20 hydrocarbon	6.38	460 J
5-Hexen-2-one, 5-methyl-	6.70	740 JN
Unknown ketone or ester	8.46	780 J
Tetradecane	13.71	122 JN
Tridecane, 6-propyl-	14.57	130 JN
Hexadecane	16.36	114 JN
Dibenzofuran, 4-methyl-	16.95	136 JN
Heptadecane	17.57	240 JN
C9H40 hydrocarbon	17.63	152 J
C19H40 hydrocarbon	19.83	102 J
Dodecanenitrile	19.91	136 JN
C15H12 hydrocarbon	20.31	102 J
Hexadecanoic acid and unknown	20.55	480 J
C20H42 hydrocarbon	20.88	106 J
C16H14 hydrocarbon	21.73	114 J
Unknown hydrocarbon	23.75	140 J
Unknown hydrocarbon	27.10	122 J
C20H12 hydrocarbon and unknown	29.41	168 J
Unknown	38.02	580 J

Note: Shaded boxes indicate a rejected background sample.

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Pesticide/Pcb Analysis for Surface Soil Samples MSD #4 Sludge and Barrel Dump			
Pesticide/ PCB	Sample Location and Number Concentrations in ug/kg		
	SS01	SS02 Background	SS03
Alpha-BHC	2.1 U	2.0 U	1.9 U
Beta-BHC	2.1 U	2.0 U	1.9 U
Delta-BHC	2.1 U	2.0 U	1.9 U
Gamma-BHC (Lindane)	2.1 U	2.0 U	1.9 U
Heptachlor	2.1 U	2.0 U	1.9 U
Aldrin	2.1 U	2.0 U	1.9 U
Heptachlor Epoxide	2.1 U	2.0 U	1.9 U
Endosulfan I	2.1 U	2.0 U	1.9 U
Dieldrin	4.2 U	3.9 U	3.7 U
4,4'-DDE	4.2 U	3.9 U	3.7 U
Endrin	4.2 U	3.9 U	3.7 U
Endosulfan II	4.2 U	3.9 U	3.7 U
4,4'-DDD	29 P	31 P	27 PJ
Endosulfan Sulfate	4.2 U	3.9 U	3.7 U
4,4'-DDT	4.2 UJ	3.9 UJ	3.7 U
Methoxychlor	21 UJ	20 UJ	19 U
Endrin Ketone	4.2 U	3.9 U	3.7 U
Endrin Aldehyde	4.2 U	3.9 U	3.7 U
Alpha-Chlordane	2.1 U	2.0 U	1.9 U
Gamma-Chlordane	2.1 U	2.0 U	1.9 U
Toxaphene	210 U	200 U	190 U
Aroclor-1016	42 U	39 U	37 U
Aroclor-1221	84 U	78 U	74 U
Aroclor-1232	42 U	39 U	37 U
Aroclor-1242	42 U	39 U	37 U
Aroclor-1248	42 U	39 U	37 U
Aroclor-1254	400 P	170 P	160 P
Aroclor-1260	42 U	39 U	37 U

Note: Shaded boxes indicate a rejected background sample.

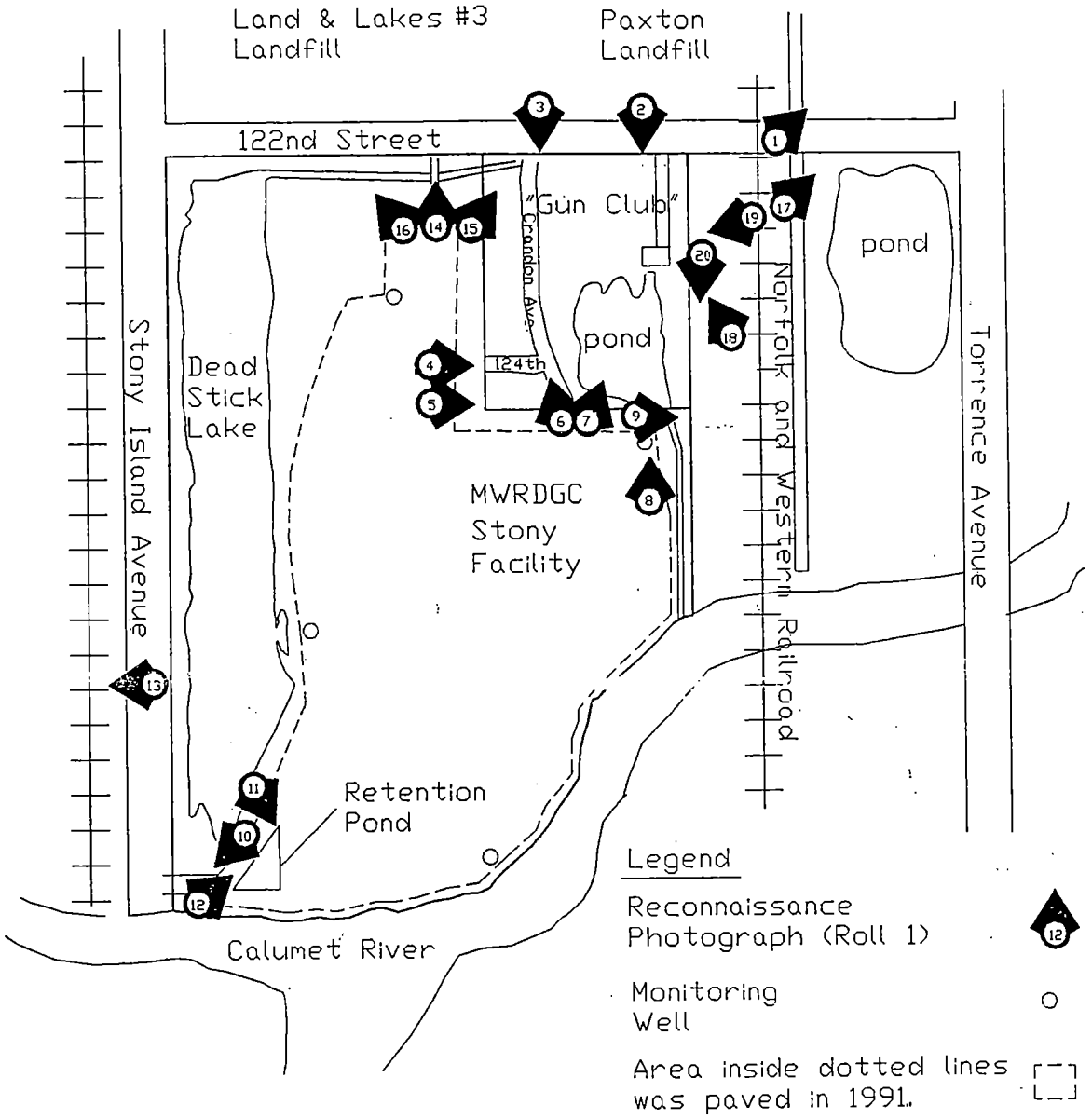
Inorganic Analysis for Soil Samples MSD #4			
Metals and Cyanide	Sample Locations and Number Concentrations in mg/kg		
	SS01	SS02 Background	SS03
Aluminum	10700	7270	14900
Antimony	9.3 RUN	8.5 RUN	8.2 RU
Arsenic	9.9 S*	13.9 *	15.3 *
Barium	147 J	81.6 J	200 J
Beryllium	0.52 U	0.59 B	2.7
Cadmium	8.0	5.0	0.68 U
Calcium	50700	39100	120000
Chromium	204 JN	113 JN	232 JN
Cobalt	7.2 B	7.0 B	4.5 B
Copper	88.2 J	58.3 J	88.2 J
Iron	24000	17600	33800
Lead	77.6 J	56.8	89.8 J
Magnesium	22000	17300	42200
Manganese	1380	1180	4160
Mercury	0.13 U	0.12 U	0.11 U
Nickel	32.7	22.9	26.1
Potassium	2430	1330	1360
Selenium	0.52 UJW	0.47 U	0.46 UJ
Silver	3.1 JN	1.4 UJN	1.7 JN
Sodium	263 B	160 B	672 B
Thallium	0.52 UJW	0.47 UJW	0.46 U
Vanadium	43.5	35.7	65.2
Zinc	320 JN	221 JN	214 JN
Cyanide	1.3 U	1.2 U	1.1 U

Note: Shaded boxes indicate a rejected background sample.

Appendix D

MSD #4 Sludge and Barrel Dump

Site Photographs



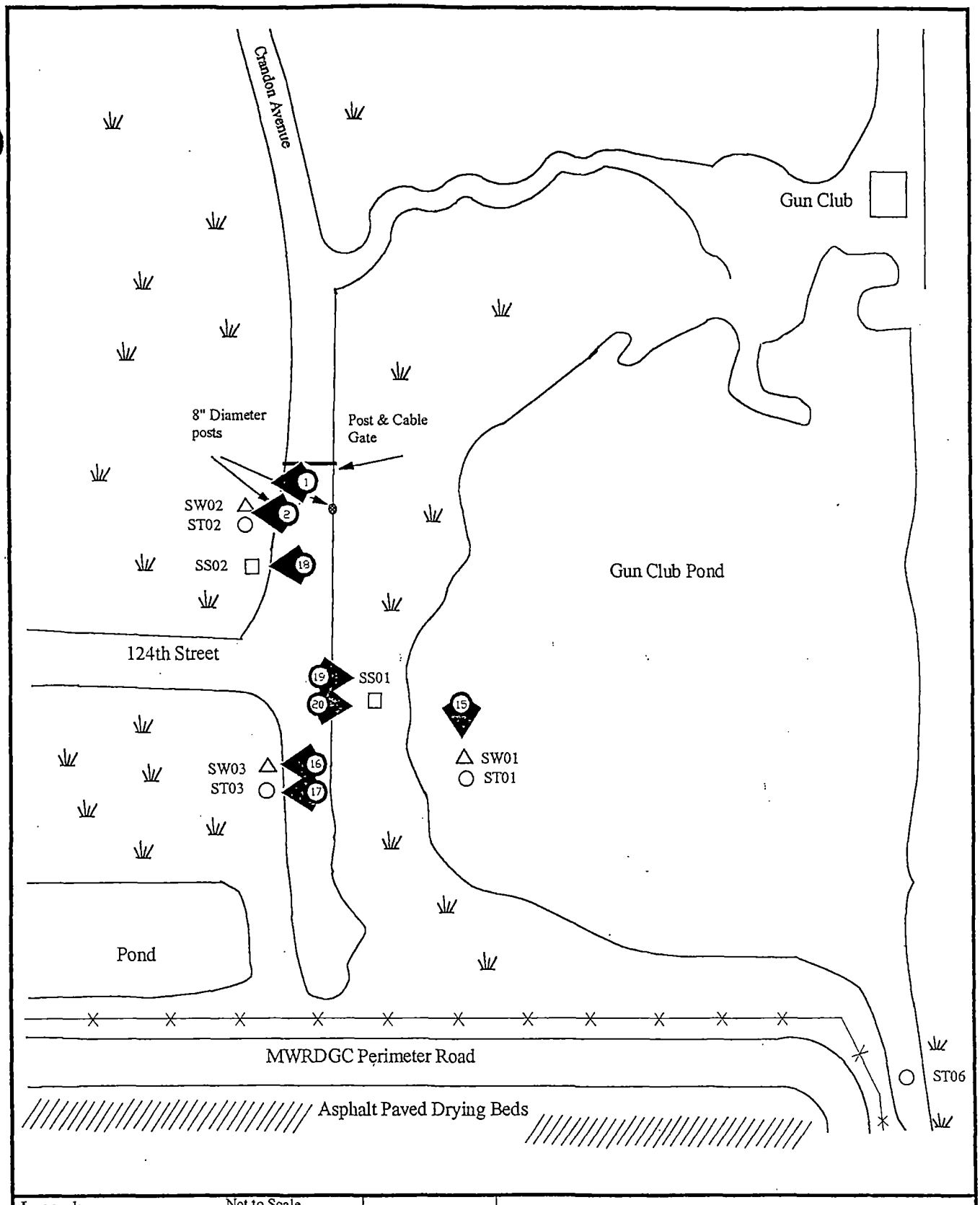
Not to Scale

Figure D-1 Photograph Locations, Reconnaissance (Roll 1)

MSD #4 Sludge and Barrel Dump
Chicago, Illinois

Name: FRE 00033

Date: 03/30/94



Legend:
- Sediment Sample
- Surface Water Sample
- Surface Soil Sample
- Phragmites & other wetland vegetation
- Fence
- Sampling Photograph

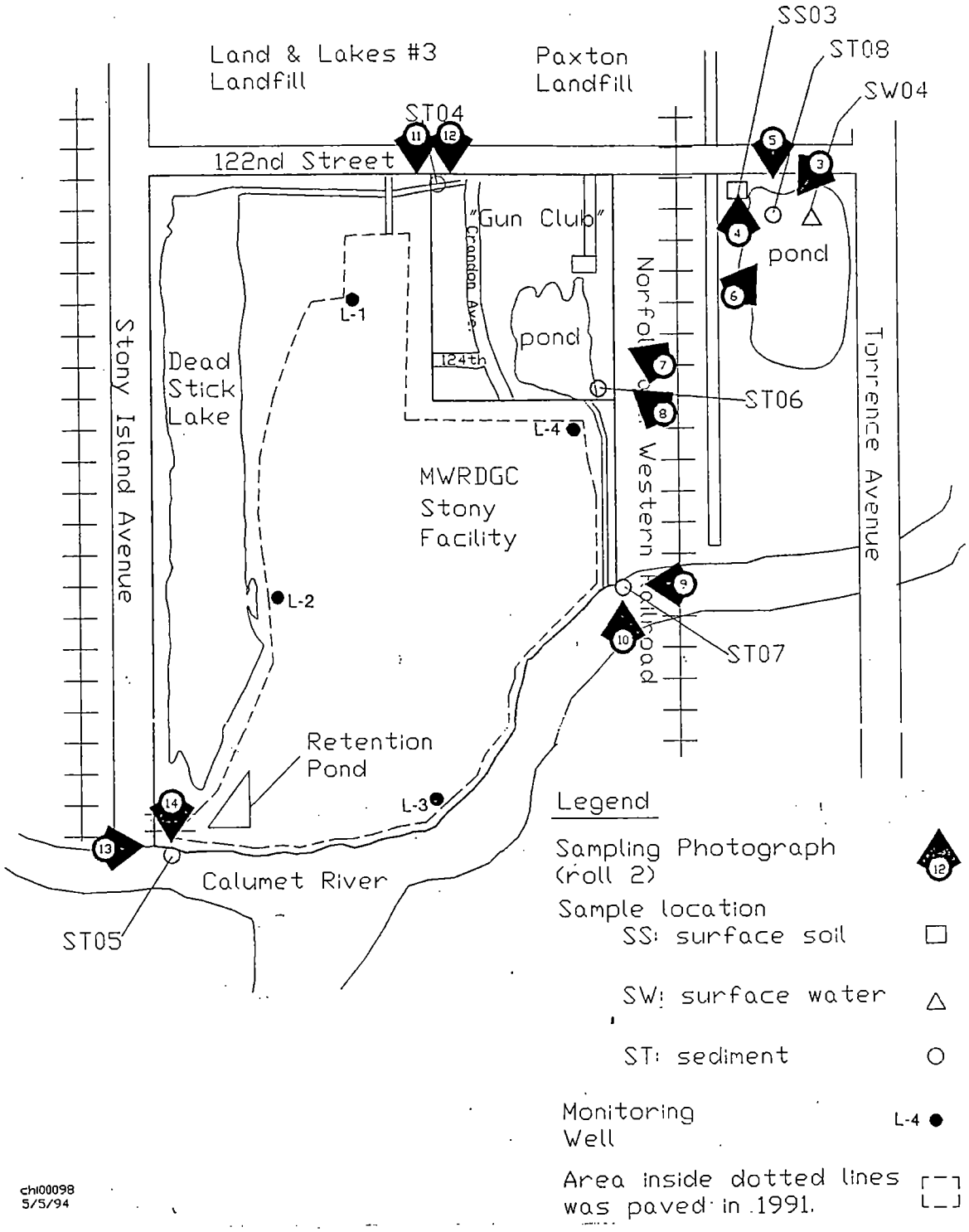
Not to Scale

N

Figure D-2 Photograph Locations
Drum Release Area Sampling (Roll 2)

MSD #4 Sludge and Barrel Dump
Chicago, Illinois

Name: FRE 00032
Date: 03/30/94



Not to Scale

Figure D-3 Photograph Locations, Perimeter Sampling (Roll 2)

MSD #4 Sludge and Barrel Dump
Chicago, Illinois

Name: FRE 00034
Date: 03/30/94

Date: April 13, 1993

Time: 0845

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 1

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northwest

Description: View to northeast from the intersection of Norfolk and Western Railroad and 122nd Street to black-crowned night heron rookery in the distant trees.

Date: April 13, 1993

Time: 0845

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 2

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: View to south from 122nd Street. Old drums approximately 30 feet south of road and 100 feet west of the Norfolk and Western Railroad.

Date: April 13, 1993

Time: 0845

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 3

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: View to south, down Crandon Avenue, from 122nd Street, directly south of Paxton Landfill office. Road on which 1980 drum release occurred.

Date: April 13, 1993

Time: 0945

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 4

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: East

Description: View to east from MWRDGC east perimeter. The visible gravel road 123rd Avenue east to area of the 1980 drum release.

Date: April 13, 1993

Time: 0945

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 5

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: East

Description: View to east from MWRDGC east perimeter. Property line between MWRDGC and the "gun club" runs east/west through this pond, according to George Hall MWRDGC.

Date: April 13, 1993

Time: 0950

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 6

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northwest

Description: View to northwest from MWRDGC. Crandon Avenue is visible on the right. Road runs north from here.

Date: April 13, 1993

Time: 0950

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 7

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northeast

Description: View to northeast from MWRDGC. Crandon Avenue is visible on the left. Road runs north from here.

Date: April 13, 1993

Time: 0950

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 8

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: North

Description: View to north from MWRDGC east corner. Monitoring well in foreground. "Gun club" in central background. Paxton Landfill in left background.

Date: April 13, 1993

Time: 0950

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 9

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: East

Description: View to east from MWRDGC east corner. Outlet of "gun club" pond is to right. Hooded merganser in water. Norfolk and Western Railroad in background.

Date: April 13, 1993

Time: 0955

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 10

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Southwest

Description: View to southwest. Stony Island Avenue entrance, formerly the primary entrance. Metal shed contains controls for the Stony facility retention pond release to the city storm sewer. CID Landfill in left background.

Date: April 13, 1993

Time: 0955

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 11

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Southeast

Description: View to southeast. MWRDGC retention pond and water level control weir. CID Landfill in right background.

Date: April 13, 1993

Time: 0955

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 12

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northeast

Description: View to northeast. Facility retention pond.

Date: April 13, 1993

Time: 1005

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 13

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West

Description: Drum abandoned on west side of Stony Island Avenue, between 122nd and 126th Streets. Label: RSD 20-30-4-85, Standard Paste & Lube Co., N. Oakley, Chicago, Illinois

Date: April 13, 1993

Time: 1035

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 14

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: North

Description: From MWRDGC Stony facility entrance to 122nd street. Drainage ditch inside fence, flow is from right, under drive, to left. Paxton Landfill in background.

Date: April 13, 1993

Time: 1035

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 15

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northeast

Description: View to northeast. Ditch flows from right, under facility entrance drive.

Date: April 13, 1993

Time: 1035

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 16

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northwest

Description: View to northwest. Ditch flows from right to left, away from facility entrance, along 122nd street.

Date: April 13, 1993

Time: 1100

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 17

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northeast

Description: View to northeast from road east of Norfolk and Western Railroad, just south of 122nd Street. Man from Chicago Mosquito Abatement clears a culvert. Flow through culvert is evident from the white water around his shovel.

Date: April 13, 1993

Time: 1100

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 18

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northwest

Description: View to northwest, "gun club" is in middle ground. Paxton Landfill in background.

Date: April 13, 1993

Time: 1100

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 19

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West southwest.

Description: View to west southwest from the Norfolk and Western Railroad to "gun club."

Date: April 13, 1993

Time: 1100

Photo Taken By: M.K. Casserly

Roll Number: 1
Photo Number: 20

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: View to south from Norfolk and Western Railroad. The "gun club" apiary.

Date: July 13, 1993

Time: 1122

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 1

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West

Description: Northwest corner of Crandon Avenue and 124th Street intersection. Personnel enter phragmites.

Date: July 13, 1993

Time: 1130

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 2

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West

Description: Northwest corner of Crandon Avenue and 124th Street intersection. Collection of head space sample from a shovelful of sediment.

Date: July 14, 1994

Time: 1200

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 3

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Southwest

Description: Pond located in southeast corner of 122nd Street and Norfolk and Western Railroad intersection. Drums dumped in pond are not a part of this inspection but were reported to IEPA emergency response personnel. This is the area of background samples SS03, ST08a, SW04.

Date: July 14, 1994

Time: 1200

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 4

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: North

Description: SS03 (rejected background): facing north, southeast of 122nd Street and Norfolk and Western Railroad intersection. Orange flag shows location of surface soil sample SS03. Duplicate surface soil sample was collected here.

Date: July 14, 1993

Time: 1200

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 5

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: ST08a (rejected background): facing south, looking down steep grade, southeast of 122nd Street and Norfolk and Western Railroad intersection.

Date: July 14, 1993

Time: 1200

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 6

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northeast

Description: ST08a (rejected background) SW04: facing northeast. Sediment sample ST08a is at the base of the bare hillside, and SW04 is directly out into the water.

Date: July 14, 1993

Time: 1320

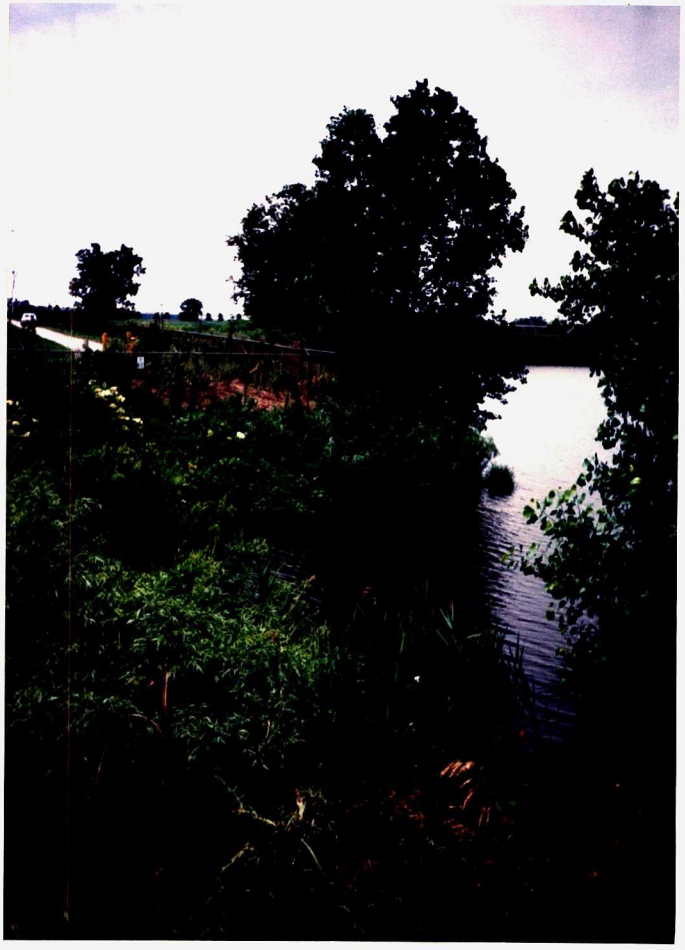
Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 7

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northwest

Description: ST06: facing northwest, closeup. Sediment sample ST06 is located at the outlet of the gun club pond, southeast corner of pond.



Date: July 14, 1993

Time: 1320

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 8

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: Northwest

Description: ST06: Facing northwest, area view. Sediment sample ST06 is located at the orange flag at outlet of the gun club pond, southeast corner of pond.

Date: July 14, 1993

Time: 1330

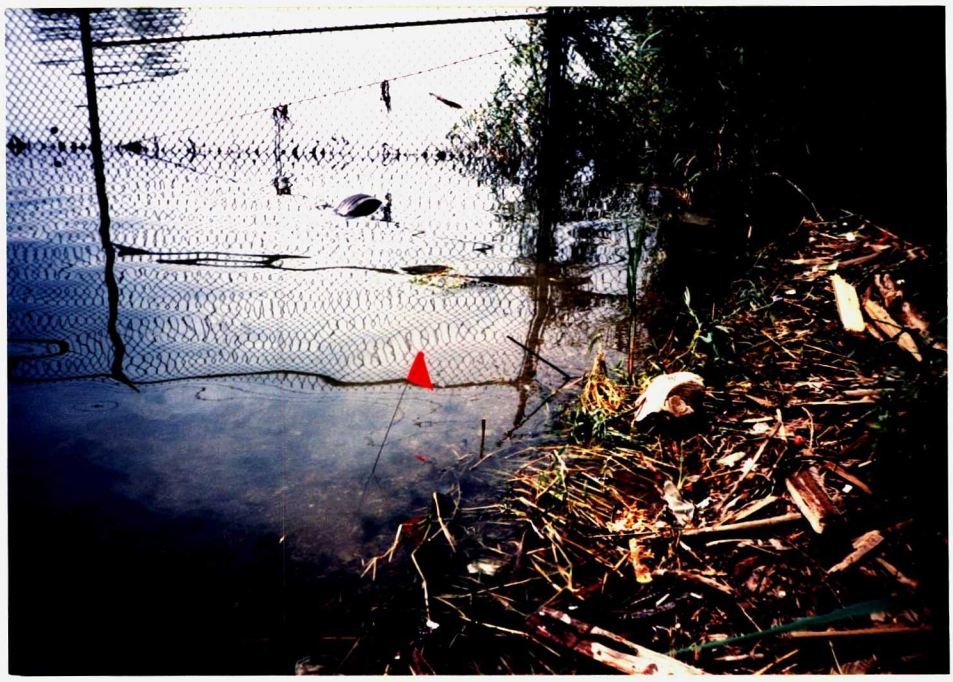
Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 9

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West

Description: ST07: facing west. Closeup of sediment sample ST07, located at Calumet River at outlet of ditch draining the gun club pond.



Date: July 14, 1993

Time: 1330

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 10

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: North

Description: ST07: facing north. Area view of sediment sample ST07 located at Calumet River at outlet of ditch draining the gun club pond.

Date: July 14, 1993

Time: 1630

Photo Taken By: M. Mastronardi

Roll Number: 2
Photo Number: 11

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: ST04: facing south. Closeup of sediment sample ST04 collected in ditch on south side of 122nd Street, at northeast corner of MWRDGC Stony facility fence, in ditch draining gun club property. Ditch drains to west to Dead Stick Lake.

Date: July 14, 1993

Time: 1630

Photo Taken By: M. Mastronardi

Roll Number: 2
Photo Number: 12

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: ST04: facing south. Area view of sediment sample ST04 collected in ditch on south side of 122nd Street, at northeast corner of MWRDGC Stony facility fence, in ditch draining gun club property. Ditch drains to west to Dead Stick Lake.

Date: July 15, 1993

Time: 1025

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 13

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: East

Description: ST05: facing east. Area view of sediment sample ST05 collected six feet west of outfall of Dead Stick Lake to the Calumet River.

Date: July 15, 1993

Time: 1025

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 14

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: ST05: facing south. Area view of sediment sample ST05 collected six feet west of outfall of Dead Stick Lake to the Calumet River.

Date: April 15, 1993

Time: 1145

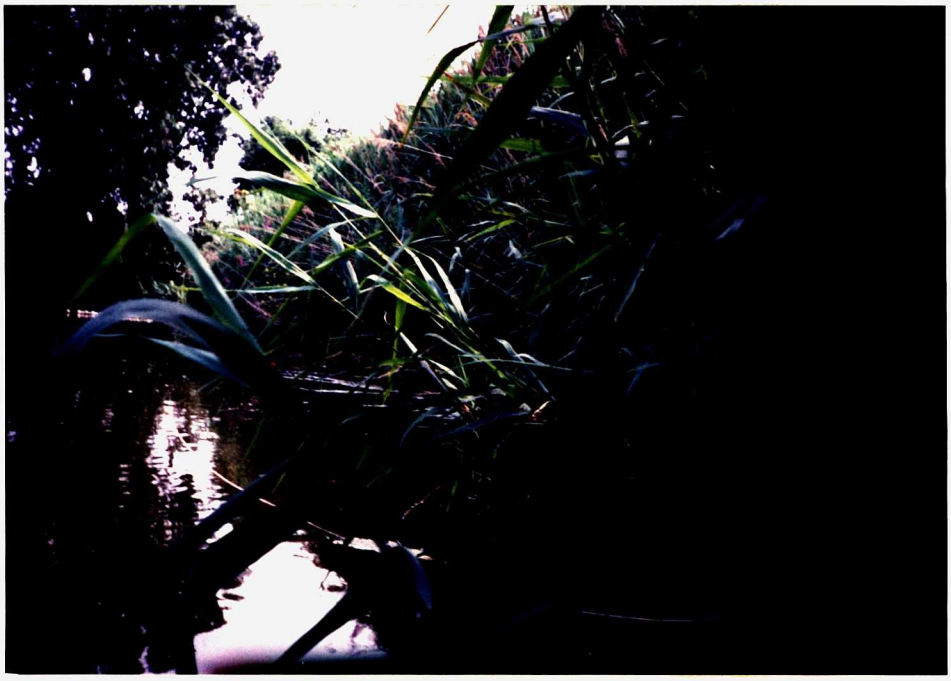
Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 15

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: South

Description: SW01 and ST01: facing south. Area view of west bank of gun club pond where surface water sample SW01 and sediment sample ST01 were collected. Flag tape tied to phragmites in background shows locations of head space samples collected 7/13/93.



Date: July 15, 1993

Time: 1150

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 16

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West

Description: SW03 and ST03: facing west. Closeup of collection of surface water sample SW03 and sediment sample ST03, west of Crandon Avenue, south of 124th Street.

Date: July 15, 1993

Time: 1150

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 17

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West

Description: SW03 and ST03: facing west. Area view of surface water SW03 and sediment sample ST03, west of Crandon Avenue, south of 124th Street. View shows samples location in relation to cottonwood tree.

Date: July 15, 1993

Time: 1200

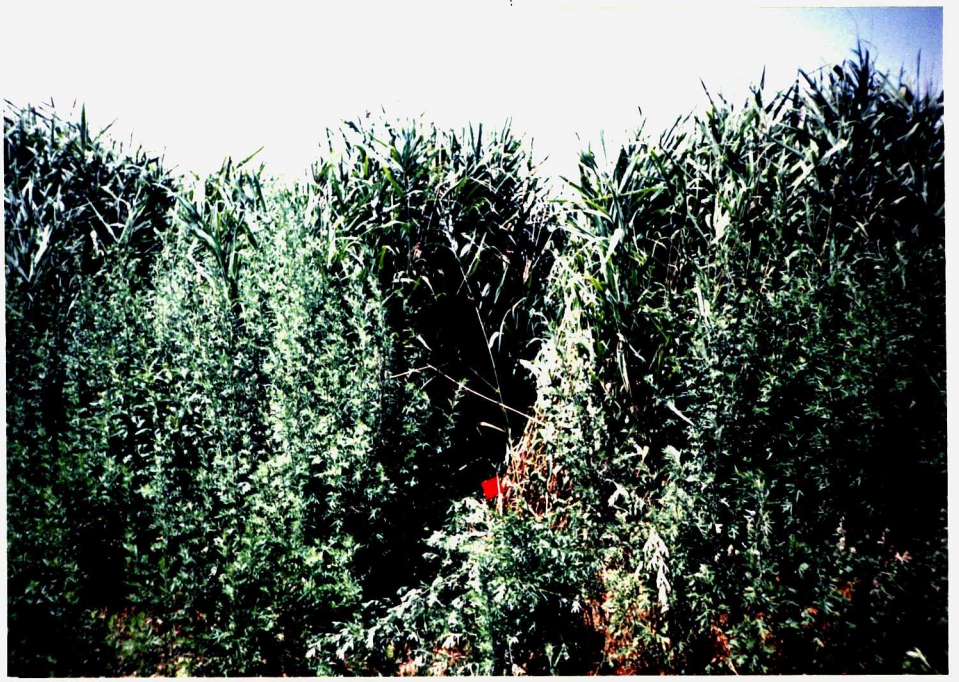
Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 18

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: West

Description: SS02: facing west. Surface soil sample SS02, west of Crandon Avenue, north of 124th Street.



Date: July 15, 1993

Time: 1315

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 19

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: East

Description: SS01: facing east. Closeup of surface soil sample SS01, collected east of Crandon Avenue, in ditch.

Date: July 15, 1993

Time: 1315

Photo Taken By: M.K. Casserly

Roll Number: 2
Photo Number: 20

Location/ILD #: MSD#4 Sludge and Barrel Dump, Chicago, IL - ILD 980 498 349

Direction of Photo: East

Description: SS01: facing east. Area view of the path to surface soil sample SS01, marked by orange flag tape tied in phragmites. Path on right leads to surface water sample location SW01.